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THE HEATING AND VENTILATING MAGAZINE

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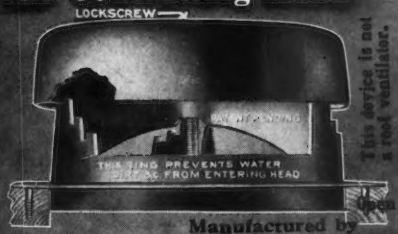
1123 Broadway, New York

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 12 E. 42ND ST. 188-200 FRANKLIN ST. BOSTON.

THE "GLOBE" VENTILATOR
COPPER AND GALVANIZED IRON
SIMPLE, SYMMETRICAL, STORM PROOF, SUCCESSFUL
Model and Blue Print on Application
GLOBE VENTILATOR CO., TROY, N. Y.

Knowles Mushroom Diffuser and Air Controlling Head (Improved Notch Style) ADJUSTABLE



This device is not a roof ventilator.

Placed under seats in all auditoriums. A perfect Air Controlling Head and Diffuser, assuring *uniform distribution.*

Manufactured by
Knowles Mushroom Ventilator Co.
Successor to Geo. E. Knowles 9 Church St., New York
Telephone, Cortlandt 7811

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Should be continuously recorded by means of
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BRISTOL'S
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Will Keep Oil Out of Your Boiler
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Ross Valve Mfg. Co. Troy, N. Y.

Ask for List of Users

MICHIGAN STANDARD TIN-LINED WOOD COVERING
FOR INSULATING UNDERGROUND STEAM PIPES

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THE MICHIGAN PIPE CO., Bay City, Mich.

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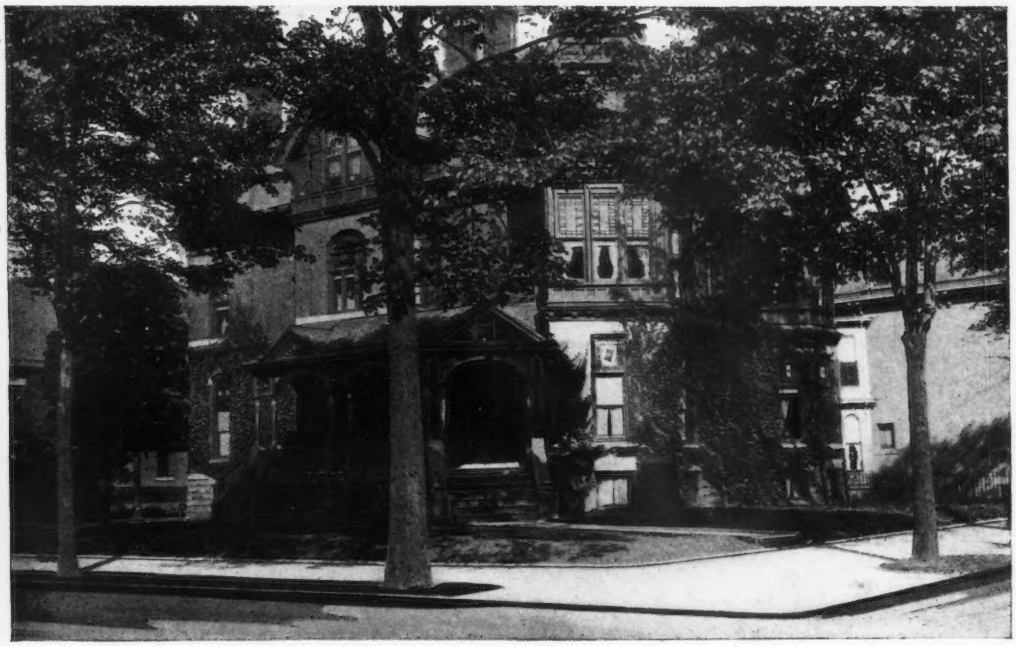
(Opportunity Talks No. 5)

All Types of Buildings Use Central Station Heat



Pennsylvania Residence Obtaining Steam Heat from Central Station

Personal comfort is the greatest essential of the perfect home and by personal comfort is meant all those conditions which contribute to the welfare of its occupants. Prominent among these conditions are sanitation, ventilation and the ideal regulation of the heating apparatus.

District heating as an investment, offers a most favorable opportunity for capital. The income per mile from a system of steam mains is far in excess of either gas, electric light or water. Most consumers pay more for heating service than for all the other public services combined.

The financial success of the hundreds of companies which have installed our central station steam heating system cannot fail to impress the investors by reason of their pronounced success.

THERE IS MONEY FOR YOU IN WORKING UP the PROPOSITION for YOUR TOWN

Send for our plan. Ask for our book on "Central Station Heating."

American District Steam Company

General Offices and Works: NORTH TONAWANDA, N. Y.

CHICAGO, ILL.—First National Bank Bldg. **NEW YORK—West Street Building**
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THE HEATING AND VENTILATING MAGAZINE

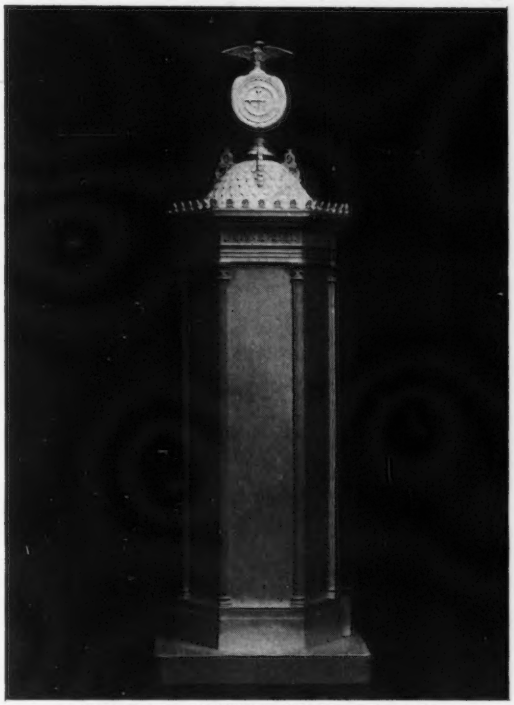
1123 BROADWAY NEW YORK AUGUST, 1915

Subway Ventilation Schemes

Only those who have ridden in a city subway on a hot, humid day can appreciate fully the significance of the agitation that has been started to improve the air conditions of subways in general and in New York City's subways in particular. It is well-known that the present ventilation of the existing subways in New York involves little more than the cleansing and re-circulation of the air. There are, to be sure, sidewalk gratings located between some of the stations which act as air outlets or inlets, as the case may be, depending on the subway air currents caused by the moving trains. The cars themselves are also equipped with ventilating fans which churn the air and give some measure of relief.

When it comes to the new extensions to the subway, which will involve more mileage by far than all of the existing subways, it seems that little progress has been made to improve on present conditions. The most that has been evolved by the subway's engineers is a system which makes use of sidewalk gratings as air outlets only, provision being made to insure such air outflow through the use of centrifugal fans.

Ever since the news was published that the sidewalk gratings were to be adopted and that they were to be located, in the case of the Broadway subway, at points where there were large numbers of passing pedestrians, especially women, an earnest cry has been raised by Broadway merchants, large and small property owners and hotel residents, protesting against the gratings. Their objections are based on the ground that the gratings are unsightly, dangerous in wet and snowy weather, objectionable in causing large volumes of hot, ill-smelling air to be ejected into the faces of passersby and, finally, in blowing dust and disarranging



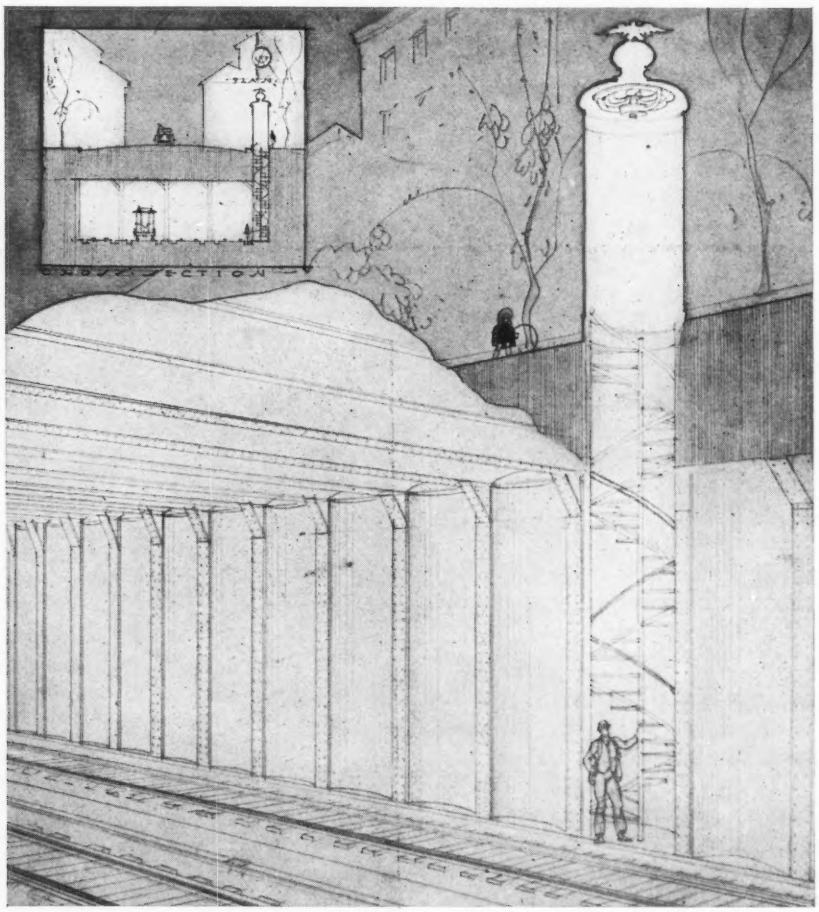
TYPICAL VENTILATING KIOSK.

the clothes of those passing directly over the gratings.

As a result of the agitation, which took concrete form in the protest of the Broadway Association, made up largely of merchants with establishments on

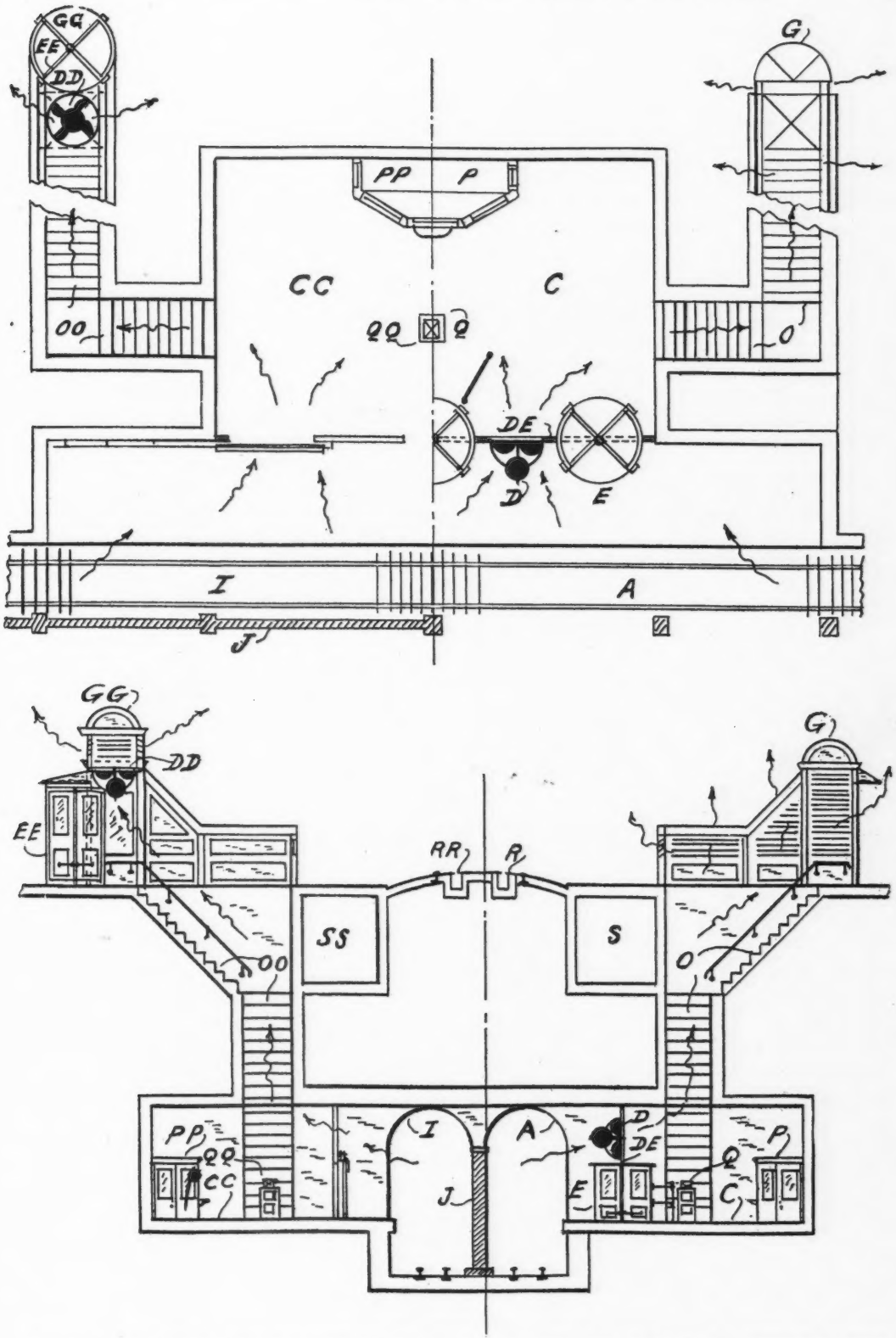
Broadway, the New York Public Service Commission adopted a resolution authorizing the chief engineer of the commission, Alfred Craven, to request the Interborough Rapid Transit Company and the New York Municipal Railway Corporation to designate their consulting engineers, to act with the commissien's chief engineer, as a board to investigate and report with recommendations upon the question of ventilation for the dual system subways. The consulting engineers for the Interborough company are William Barclay Parsons and S. L. F. Deyo, and those for the New York Municipal Railway Corporation are Jacobs and Davies, Inc., and L. B. Stillwell, of New York.

Arrangements were made for a public hearing on the proposition which was held before the Public Service Commission June 16, last. At this hearing several schemes for ventilating the new subways, besides sidewalk gratings were presented. One of the most interesting was a system of kiosk ventilators similar to those of Berlin, Dresden, Munich, Paris, Buenos Aires, Rio Janeiro and other foreign cities. One of the features of the kiosk ventilator is its possible use for advertising purposes. It was stated that the income that could be derived from the yearly rental of the kiosks might run up into hundreds of thousands of dollars. The only obligation on the part of the city would be the subsurface construction and the granting of a franchise to a company to use the panels of the kiosks for advertising purposes.



ARRANGEMENT OF KIOSK VENTILATING SYSTEM FOR SUBWAYS.

The kiosks are of statuary bronze 12 ft. high and 5 ft. wide. They are intended to be placed directly over a duct built to the street level. Being 2 ft. wider than the lateral tunnels of foreign cities, it is planned to put a spiral stairway in the interior for use in case of subway acci-



PLAN AND ELEVATION OF THE SCHEME PROPOSED BY JAMES G. DUDLEY FOR VENTILATING NEW YORK'S SUBWAYS.

dents. When provided with suitable fans, the kiosks are of sufficient size to permit the outflow of 10,000 cu. ft. of air per minute, or as much as can escape from 120 lin. ft. of street gratings in the same time.

With this arrangement the air is drawn up and dispelled over the heads of passing pedestrians. Provision could be made in the kiosk for sterilizing the outgoing air, if desired.

A suggestion regarding the use of the kiosk panels is that one be reserved for the public, with the idea of listing in that space the nearby hotels, names of civic officers, location of public buildings, thermometer, barometer, hygrometer, Government weather reports, etc.

The plan advocated by the promoters is to locate one kiosk on each block. It was pointed out that in foreign cities the kiosks offer the only opportunities for outdoor advertising. In Berlin the annual revenue derived from the use of the kiosks is $95,000.

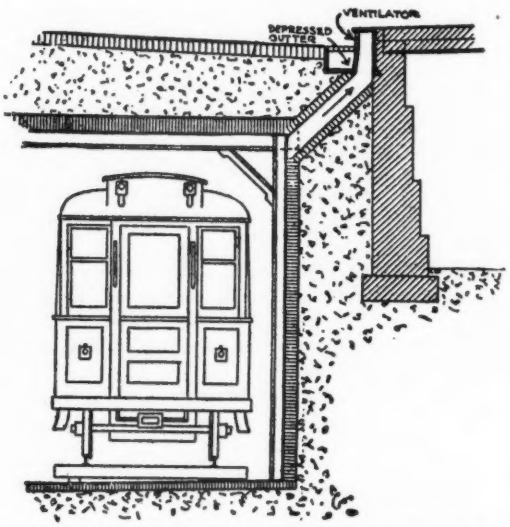
THE DUDLEY PLAN.

Another plan for ventilating the tubes is suggested by James G. Dudley, consulting engineer, of New York. This plan is to seal every other subway station against the intake of air. These will be exhaust stations, the intakes being alternating stations. The stations are to be sealed by revolving doors giving free passage to pedestrians to be built either in a partition at the rear of the station platform and reaching from roof to floor, or at the street entrances and exits. Over the doors will be fans which will draw the air from the tube to the street and well above the heads of the people.

The plan of placing the doors at the street entrances is considered the best. When so placed the fan will be located in the roof of the entrance, the foul air being driven out through apertures in the roof. The air drawn out will necessarily be balanced by the inflow at the next uncontrolled station house, insuring sectional ventilation of the entire subway. The ventilation system is designed to be operated independently of the subway power, the fans being driven by motors located at each station.

THE BOORAEM PLAN.

Another plan and one of foreign origin is the placing of gratings along the side of the street curbs for about 150 ft. on each side of a station. Connecting



HOLLOW OR OPEN CURBED SYSTEM OF VENTILATION.

with the grating is a chimney through which the foul air of the tube is designed to pass. This plan was offered by Robert E. Booraem. It is called the hollow or opened curb system of ventilation. The chimney starts from the side of the subway near to the roof and runs at an angle for 7 ft. to a horizontal duct coming to the sidewalk level. On the road side of the duct is a 10-in. screen through which the exhaust from the subway will meet the free air of the street level. It is the claim of Mr. Booraem that a 10-in. screen or hollow curb for 100 ft. on each side of a street would be equal to an air shaft 14 ins. square.

Operating Data in Connection With Federal Buildings Under Control of the Treasury Department.

By Nelson S. Thompson.

Chief Mechanical and Electrical Engineer, Office of the Supervising Architect, Washington, D. C.

II.

The accompanying table represents the operating characteristics of a large number of Federal buildings in Washington, D. C. These data were gathered in connection with a report made by the writer for the establishment of a central heating, power and lighting plant to serve the buildings noted. Based on the report an appropriation of approximately $1,500,000 was made by Congress to carry out the project.

Certain of the older Federal buildings in the larger cities were not originally provided with isolated power plants, and a few years ago the writer detailed an able engineer to visit these buildings and determine, on the ground, after full conference with the local public service officials, whether the installation of isolated plants would be justified. In one notable instance the situation was especially favorable, and the engineer reported as follows:

Sir:

* * * * * * * * *

The following data were obtained from records and conditions at the building to form a basis of data in considering the installation of a plant:

Total wattage of lamps is 377,000.
Total K.W. rating of motors is 700.
Total floor area is 660,000 sq. ft.
Present coal and current consumption—

Month.	Current in K.W.H. Summer.	Winter.	Tons of Coal. Summer	Winter.
July	98,840	.....	323.79	.....
Aug.	100,340	.....	309.35	.....
Sept.	105,860	.....	319.97	.....
Oct.	.....	117,240	.....	417.835
Nov.	.....	115,590	.....	538.427
Dec.	.....	127,080	.....	537.414
Jan.	.....	123,970	.....	837.0
Feb.	.....	125,800	.....	694.72
March	.....	125,800	.....	670.715
April	109,420	.....	406.479	.....
May	106,430	.....	316.392	.....
June	116,590	.....	269.649	.....
	637,480	735,480	1,945.630	3,696.111

	K.W.H.	Tons of Coal.
Summer months	637,480	1,945.63
Winter months.....	735,480	3,696.11
Totals	1,372,960	5,641.74

Current cost per annum, $26,113.35.

$\frac{26,113.35}{1,372,960.}$ = $0.019 per K.W.H.

Highest maximum demand for any month	340 K.W.
Lowest maximum demand for any month	225 K.W.
Average hours less than 100 K.W. demand	3,000
Average hours between 100 and 200 K.W.	2,400
Average hours between 200 and 300 K.W.	2,800
Average hours between 300 and 400 K.W.	560

Under the above operating conditions the installation of two 200 K.W. and two 100 K.W. electric generating units would give the most flexible plant and allow ample reserve.

Ample boiler capacity is now installed in the building, and it is believed that better efficiency will be obtained during the summer months with the additional load required by the electric generating plant.

Estimated cost of plant:

Engines and generators.....	$30,000
Piping	2.500
Switchboard changes	1,000
Incidentals	500
Total	$34,000(a)

(a) The plant was installed for $42,000.

COAL.

To be safe and allow 50 lbs. of steam per K.W.H. and a factor of evaporation of 8 1-3 lbs. of water per pound of coal, we would have 6 lbs. of coal per K.W.H., and charging all coal used in six months of the year, and 20% during six months of the seven that exhaust steam is utilized for heating.

637,480x6 = 3,824,880 lbs. of coal
735,480x6x.2 = 882,576 lbs. of coal

4,707,456 lbs. of coal 2,100 tons.

2,100 tons x3.15 = $6,615.00.

ASH REMOVAL.

Ash removal for 5,645 tons of coal costs now $622.41.

Ash removal for 2,100 tons of coal will cost $231.00

WATER.

Water used by the plant will be—
4,707,456 lbs. of coal x 8⅓ = 39,228,800 lbs. of water = 627,660 cubic feet x 52.5 cents (per 1,000 cubic feet) = $329.57 per annum.

LABOR.

Present Cost.

1 Chief engineer	$2,200.00
1 Assistant chief engineer.....	1,800.00
3 Assistant engineers	3,600.00
2 Engineer helpers	2,000.00
3 Oilers	2,520.00
7 Firemen	6,387.50
3 Firemen helpers	2,190.00
2 Firemen helpers for 7 months....	852.00
	$21,549.50

With an Electric Generating Plant.

1 Chief engineer	$2,200.00
1 Assistant chief engineer.....	1,800.00
3 Assistant engineers	3,600.00
4 Engineer helpers	4,000.00
4 Oilers	3,360.00
8 Firemen	7,300.00
3 Firemen helpers	2,190.00
2 Firemen helpers for 7 months....	852.00
	$25,302.00

OIL AND WASTE.

Estimated for electric generating plant	$300.00

REPAIRS.

$30,000 at 1½%.....$450.00

INTEREST AND DEPRECIATION.

$30,000 at 10%.....$3,000.00

Total cost to operate the proposed electric generating plant:—

Coal	$6,615.00
Ashes	231.00
Water	329.57
Labor	3,752.50
Oil and waste	300.00
Repairs	450.00
Interest and depreciation	3,000.00
Total annual cost	$14,678.07
Cost of current during present year	$26,113.35
Estimated cost of current with electric generating plant	14,678.07
Estimated annual saving	$11,435.28

I recommend the installation of an electric generating plant in this building at an early date, as same will pay for itself in three years.

Respectfully,

....

The plant recommended by the engineer was installed after a long controversy, and the writer takes pleasure in stating that after twelve months' operation the annual saving to the Government by the installation of this plant has amounted to $15,984.78 and it is performing its work in a satisfactory manner.

PROCEDURE WHEN CITY HAS CENTRAL HEATING PLANT.

When a Federal building is erected in a city where a district heating company has steam or hot water mains in the vicinity, the heating apparatus is designed so that the building may be operated either by its own boilers (which are always installed) or by the heating medium purchased from the district heating company. Upon receipt of the company's proposal for supply of the heating medium, which in the case of steam is nearly always based on a sliding scale so arranged that the price per thousand pounds decreases as the amount used per month increases, it is necessary for the office to determine accurately whether it will be more economical to generate its own steam or to purchase the steam from the company. The following method is used:

The actual amount in square feet of direct radiation is taken off the plans, to which is added any fan blast surface and any gravity indirect surface. To reduce to equivalent direct radiation the amount of blast coil surface in square feet is multiplied by 3, and the gravity indirect is multiplied by 1½. The equivalent direct radiation is then assumed to condense during the 212 days of the average heating season 500 lbs. of steam per square foot. To apply the sliding scale the total steam per season is apportioned as follows:

Oct.	1 to Oct. 31	5%	of total
Nov.	1 to Nov. 30	15%	of total
Dec.	1 to Dec. 31	20%	of total
Jan.	1 to Jan. 31	25%	of total
Feb.	1 to Feb. 28	15%	of total
Mar.	1 to Mar. 31	15%	of total
Apr.	1 to Apr. 30	5%	of total

The total cost is thus ascertained if steam be purchased, and it is compared on the following basis with the cost of operating the boilers in the building:

The total number of pounds of steam per annum as previously ascertained is divided by 7, which gives the number of pounds of coal per annum used under the boilers. This is reduced to tons and the local cost per ton of coal is applied. To the actual cost of coal is added the cost of ash removal, which is taken roughly as 10 cents per ton of coal, and in the infrequent cases (especially in the smaller buildings) where labor can be saved by the purchase of steam the cost of the additional labor is added. The department is usually willing to pay $100 or over per annum more for the purchase of steam in order to be relieved of the operation of the boilers, to secure freedom from smoke, dirt, etc.

If hot water is the medium the same process is used, by reducing the hot water radiation to a steam equivalent (dividing the hot water radiation by 1.6) to ascertain the amount of coal to be burned and compare it with the flat rate always quoted for hot water radiation by the local companies.

South of the Mason and Dixon line the figure 500 above noted will become 450, while in San Francisco, Cal., it will approximate 350 lbs. per square foot direct steam radiation.

The majority of the buildings are very small, and the mechanical equipment consists of a direct steam or hot-water heating apparatus and a gas and electric direct lighting system supplied with either gas or electricity from local companies. In these small buildings the matter of engineering personnel, purchase of supplies, fuel, etc., is merely routine.

It was the practice of the department

BUILDING	BOILERS		ENGINES		GENERATORS		MOTORS		LIGHTING DATA		HEATING DATA			POWER & LIGHTING LOAD		ELEVATO	
	NUMBER	TOTAL RATED HORSE POWER	NUMBER	TOTAL RATED HORSE POWER	NUMBER	TOTAL RATED KILOWATTS	NUMBER	TOTAL RATED KILOWATTS	NUMBER OF 16 C.P. LAMPS OR EQUIVALENT	TOTAL KILOWATTS LIGHTS	MAXIMUM HORSE POWER	AVERAGE HORSE POWER	STEAM FOR INDUSTRIAL PURPOSES - HORSE POWER	MAXIMUM KILOWATTS	AVERAGE KILOWATTS	NUMBER HYDRAULIC	NU ELE
BUREAU ENGRAVING AND PRINTING (Old)	7	1250	4	1300	4	1060	914	800	10,000	500	200	100	250	580	420	2	
BUREAU ENGRAVING AND PRINTING (New)	—	—	—	—	—	—	1086	969	13600	680	400	200	350	700	560	11	
DEPARTMENT OF AGRICULTURE	8	1125	1	150	1	100	137	350	2845	142	700	400	100	300	230	—	
WASHINGTON MONUMENT	2	160	1	80	1	50	Small	amount	Small	amount	Small	amount	small amount	50	25	—	
STATE, WAR AND NAVY DEPARTMENTS	4	740	3	525	3	350	27	205	4000	200	550	225	75	260	155	8	—
WINDER BUILDING	4	240	—	—	—	—	—	—	800	40	100	50	10	7	5	1	—
MILLS BUILDING	2	200	2	250	2	125	16	160	1000	50	100	50	10	100	20	—	
COURT OF CLAIMS	2	50	—	—	—	—	—	—	275	14	50	25	10	25	10	—	
WHITE HOUSE	W 2 S 2	100 130	—	—	—	—	10	23	2400	120	230	115	10	120	75	—	
TREASURY DEPARTMENT	W 6 S 5	600 660	—	—	—	—	20	120	5000	250	400	200	75	175	100	7	
DISTRICT BUILDING	4	600	3	420	3	375	21	130	3000	150	400	250	100	200	165	—	
POST OFFICE DEPARTMENT (Pa. Av. & 12th St.)	12	1200	4	1000	4	480	20	85	5000	255	800	300	30	335	155	8	
NATIONAL MUSEUM (Old)		Supplied by National Museum (New)															
NATIONAL MUSEUM (New)	4	900	4	700	4	525	75	240	⊙7850	392	700	500	25	250	125	—	
SMITHSONIAN INSTITUTE		Supplied by National Museum (New)															
ARMY MEDICAL MUSEUM	L.P. 4 H.P. 1	200 25	—	—	—	—	1	3	300	15	150	75	15	20	10	—	—
FISH COMMISSION	1	35	—	—	—	—	2 1	15 2	90	.5	35	17	small amount	30	14	—	—
TOTALS	70	7915	22	4425	22	3065	2330	3102	56160	2873	5015	2507	1060	3122	2069	37	3

"W" = WATER BOILER - BOILERS ARE STEAM UNLESS OTHERWISE NOTED "LP" = LOW PRESSURE - "HP" = HIGH PRESSURE
⊙ = SUBJECT TO AN INCREASE OF 4000 IN 2 YEARS

ESTIMATED EQUIPMENT AND OPERATING FACTORS OF THE NEW BUILDINGS (Not yet appropriated for).

BUILDING	BOILERS		ENGINES		GENERATORS		MOTORS		LIGHT DATA		HEATING DATA		STEAM FOR INDUSTRIAL PURPOSES	POWER & LIGHTING LOAD		ELEVATORS	
	NUMBER	TOTAL H.P. RATED	NUMBER	TOTAL H.P. RATED	NUMBER	TOTAL K.W. RATED	NUMBER	TOTAL K.W. RATED	NUMBER OF 16 C.P.	TOTAL K.W. LIGHTS	MAXIMUM H.P.	AVERAGE H.P.		MAXIMUM K.W.	AVERAGE K.W.	NUMBER HYDRAULIC	NUMBER ELE
DEPT. OF JUSTICE	3	400	3	450	3	300	12	240	4480	180	400	225	75	190	45	0	6
DEPT. COMMERCE & LABOR	6	850	4	1000	4	750	24	520	14000	560	850	525	150	490	125	0	14
DEPT. OF STATE	4	500	3	600	3	450	20	400	6800	270	500	300	100	300	75	0	11
TOTALS	13	1750	10	2050	10	1500	56	1160	26280	1010	1750	1050	325	980	245	0	31

CERTAIN LARGE FEDERAL BUILDINGS IN WASHINGTON, D. C.

Power & Lighting Load		Elevators		Coal Used			Cost of Current Purchased for Light & Power – Per Year	Total Kilowatt Hours Consumed Per Year – Power & Light	Engineering Personnel												Type of Heating Apparatus	Contents in Cubic Feet
									Chief Engineer		Assistant Engineers		Dynamo Tenders, etc.		Firemen		Coal Passers, etc.		Electricians			
Maximum Kilowatts	Average Kilowatts	Number Hydraulic	Number Electric	Tons Per Year	Cost Per Ton	Total Cost Per Year			Annual Salary	Annual Total	Number & Salaries	Annual Total	Number & Salaries	Annual Total	Number & Salaries	Annual Total	Number & Salaries	Annual Total	Number & Salaries	Annual Total	Grand Totals		
560	420	2	4	7088	$3.15	$22326	—	1466500	$1700	$1700	1@$1248 p.d. 3@$1064 p.d.	$5040	3@$352 p.d	$3300.	7@$285 p.d. 1@$300 p.d.	$7250	1@$211 p.d. 2@$184 p.d.	$1850	—	—	$19140	Steam	5,000,000
700	560	11	—	6700	$3.15	$21105	$37112	2000000	$1700	$1700.	1@$1248 p.d. 3@$1064 p.d.	$6040.	—	—	6@$900	$5400	—	—	3@$1200	$3600	$15740	Steam	7,000,000
300	230	—	3	5304	$3.20	$16973	$14632	711000	$1800	$1800	2@$1000 1@$1400	$3400	—	—	7@$720	$5040	3@$600	$1800	—	—	$12040	Steam	3,500,000
50	25	—	1	235	$5.60	$1315	—	55000.	$960	$960	1@$840	$840	—	—	2@$660	$1320	—	—	—	—	$3120	Steam	
260	155	8	—	3867	$3.37	$13020	$3108	461600	$1400	$1400	5@$1000	$5000	3@$900	$2700	1@$720 3@$660	$12060	—	—	1@$1200	$1200	$22360	Water	7,053,500
7	5	1	—	346	$3.60	$1247	$1645	27419	—	—	1@$1000	$1000	—	—	2@$720 3@$660	$3420	—	—	—	—	$4420	Steam	600,000
100	20	—	2	650	$3.30	$2145	From State	War & Navy	$1200	$1200	← Included in State, War and Navy Departments										$1200	Steam	750,000
25	10	—		193	$4.05	$782	$65	2400	—	—	—	—	—	—	3@$720	$2160	—	—	—	—	$2160	Steam	600,000
120	75	—	2	300	$6.00	$1800		154454	←		Included in State War and Navy Departments											½ Steam ½ Water	2,000,000
175	100	7	4	2840	$3.91	$11106	$11447	329,700	$1400	$1400	3@$1000	$3000	—	—	5@$660 6@$720	$7620	1@$500 ½@660	$830	1@$1400	$1400	$14250	Water and Small Amount Steam	6,250,000
200	165	—	7	2133	$3.00	$6399	—	520,000	$1400	$1400	3@$1000	$3000	2@$875	$1750	3@$720	$2160	3@$600	$1800	1@$1200 1@$840	$2040	$12150	Steam	4,600,000
335	155	8	3	5700	$4.24	$24200	—	866,599	$1400	$1400	6@$1000	$6000	3@$900	$2700	13@$720	$9360	1@$660	$660	1@$1400 2@$1200	$3800	$29860	Steam	8,450,000
																						Steam	
250	125	—	8	4000	$3.30	$13200	$1000	334,230	$1800	$1800	3@$1200	$3600	2@$720	$1440	4@$720	$2880	1@$600 1@$1080	$3480	1@$660 1@$1080 2@$1200 1@$900	$5345	$18545	½ Steam ½ Water	8,000,000
																						Steam	
20	10	—	—	253	$5.49	$1400	$250	7062	$1400	$1400	1@$900	$900	—	—	2@$720	$1440	—	—	—	—	$3740	Steam	1,500,000
30	14	—	—	104	$5.80	$603	$1185	26207	$1080	$1080	—	—	—	—	3@$720	$2160	—	—	—	—	$3240	Steam	3,000,000
3122	2064	37	35	39718	$4.81	$137621	$70444	6,962,171	$17240	$17240		$36820		$11890		$62,270		$16360		$17385	$164965		55,603,500

(Not appropriated for).

Power & Lighting Load		Elevators		Coal Used			Engineering Personnel		Type of Heating Apparatus	Contents Cubic Feet
Maximum K.W.	Average K.W.	Number Hydraulic	Number Electric	Tons Per Year	Cost Per Ton	Total Cost Per Year	Number	Total Annual Salary		
190	45	0	8	2000	$3.20	$6400	22	$17000	Steam	5,000,000
270	125	0	16	5000	3.28	16000	34	24000	Steam	10,000,000
400	75	0	15	2500	3.28	8000	22	17000	Steam	7,000,000
780	245	0	39	9500	$3.20	$30400	78	$58,000		22,000,000

to purchase coal on the B. T. U. basis for all buildings where the cost exceeded $1,500 per annum, but this method of purchasing has been discontinued except for the large buildings.

When coal is purchased under the B. T. U. system the specifications state what kind of coal is desired, and limit the amount of volatile matter and ash which will be permitted.

Each bidder offers such coal as he thinks will meet the specification, and gives in his proposal the following information relative to the coal he proposes to supply:

Number of B. T. U. per pound of dry coal as received.

Percentage of ash per pound of dry coal.

Cost per ton of coal.

As there is always a variation in the ash content of coal offered by the various bidders, it is necessary, in order to reduce all to the same basis, to fix a standard ash content and make an allowance for variation from same.

The lowest ash content stated by any bidder is made the standard, and all other coal is brought to this basis by adding 2 cents per ton to the price quoted for each 1 per cent. or fraction thereof the ash content exceeds the arbitrary standard.

When all proposals have been brought to the same basis in regard to ash content, the lowest price quoted per 1,000,000 B. T. U. is readily ascertained by the following formula: Cost per million B. T. U. $= \frac{1{,}000{,}000 \times \text{price per ton of coal}}{2{,}240 \times \text{B.T.U. per pound of coal}}$

When the coal purchased under the B. T. U. system is delivered at the building samples are taken and sent to the Bureau of Mines for analysis, the result of which determines the payment to be made for the coal delivered. If the analysis shows that the contractor has fulfilled his agreement, no more and no less, the contract price is paid; otherwise, corrections above or below the contract price are made for variation in B. T. U. and ash.

The correction for B. T. U. is made by the following formula:

$$\frac{\text{Delivered B. T. U.} \times \text{contract price per ton}}{\text{Contract number of B. T. U. per pound}} = \text{price paid per ton.}$$

For example: If the contractor stated that his coal contained 14,000 B. T. U. per pound and the price per ton was $3, and the coal delivered contained 14,300 B. T. U. per pound, he would be paid per ton

$$\frac{14{,}300 \times 3}{14{,}000} = \$3.0643$$

The price to be paid must be further corrected for any variation in ash content. For all coal, which by analysis contains less ash than that established in the proposal, a premium of 2 cents per ton for each whole per cent less ash is paid. An increase of 2 per cent. in ash over the contract amount is tolerated without deduction, but for any excess a penalty is exacted in accordance with the following table:

Ash as established in proposal	No deduction for limits below	Cents per ton to be deducted: 2	4	7	12	18	25	35	Maximum limits for ash
		Percentages of ash in dry coal							
Per cent.									
5	7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	12
6	8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	13
7	9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	14
8	10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	14
9	11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	15
10	12	12-13	13-14	14-15	15-16	16-17	17-18		16
11	13	13-14	14.15	15-16	16-17	17-18	18-19		16
12	14	14-15	15-16	16-17	17-18	18-19	19-20		17
13	15	15-16	16-17	17-18	18-19	19-20	20-21		18
14	16	16-17	17-18	18-19	19-20	20-21	21-22		19
15	17	17-18	18-19	19-20	20-21	21-22			19
16	18	18-19	19-20	20-21	21-22	22-23			20
17	19	19-20	20-21	21-22	22-23				21
18	20	20-21	21-22	22-23					22

When local conditions permit the choice of either gas or electricity as the illuminating medium, preference is given to electricity for many practical reasons, such as maintenance, adjustments, etc., and on account of the great amount of heat generated by the gas, which is a decidedly objectionable feature during the summer months.

With combination lighting fixtures designed to give satisfactory illumination using either tungsten lamps or Welsbach gas lamps, the cost of illuminating a building will be about the same for gas and electricity if gas is selling at $1 per thousand cubic feet and electricity at 10 cents per kilowatt-hour. The theoretical ratio of cost based on *equal* illumination is approximately 30 to 1 on the basis that 1 watt of electricity will give 10 lumens on an average and gas 300 lumens per cubic foot on an average, but actual experience has demonstrated that the true ratio is 10 to 1, under practical operating conditions as found in Federal buildings.

Where conditions permit the use of either gas or electricity their relative costs are carefully analyzed in each case, on the assumption that the full connected lighting load of a building will be in service 1,200 hours per annum. The following data are used in connection with the gas lighting:

Pilot uses 1/15 cu. ft. of gas per hour and burns continuously.

Welsbach inverted No. 4T uses 1.6 cu. ft. per hour and gives 450 lumens. No. 3T uses 2½ cu. ft. per hour and gives 900 lumens. Junior upright uses about 1¾ cu. ft. and gives 350 lumens. Inverted No. 20 uses 9 cu. ft. per hour, and gives 2,400 lumens. Welsbach inverted No. 1 uses 3½-4 cu. ft. per hour and gives 400 lumens. Welsbach upright gallery burner uses 4½ cu. ft. per hour and gives 800 lumens.

Records for Two Factory Buildings and a Y. M. C. A. Building

By S. R. Lewis.

Following are the data presented by S. R. Lewis in the course of his address as president of the American Society of Heating and Ventilating Engineers at its recent annual meeting, on the operating costs of the heating plants in three typical buildings:

In 1912 two large factories were designed by the same architects, one in Toledo and one in Detroit. The writer designed the heating equipment for both plants.

The character of the construction is identical. There are no basements, but there are some tunnels provided under the first floors for air ducts, service pipes, wiring, etc. The buildings are of reinforced concrete construction with solid concrete floors, mushroom type, and 12 in. brick curtain walls. The glass is set in tight, steel frames extending practically from floor to ceiling, and from column to column. The ratio of glass to exposed wall is approximately three to one. The roof is a concrete slab with a cinder fill and tar above.

The Toledo building is heated and ventilated by an all indirect system, equipped with automatic temperature and humidity control, the humidifying being by means of steam jets. There is direct radiation whatever, except in a a few toilet and service rooms.

The Detroit building is heated entirely by direct radiation, about one-half of the radiation being placed on the side walls and one-half on the ceiling. Great care was taken, however, in placing the radiation on the side walls to provide for a very liberal circulation of air behind it. The Detroit building has no automatic temperature control, although good hand regulation is obtainable by shutting off parts of the radiation.

Both plants are equipped with efficient, two-pipe, vacuum systems.

The Toledo plant is unique in its design to the extent that the blast heating surface is arranged at the bases of the vertical flues and so proportioned that much the same effect is obtained every day as would be obtained by having direct radiators in the various rooms, since gravity indirect heating is always in effect whenever there is any steam in the radiation. The theory in the design was that the Toledo plant should be economical, comparing with direct radiation by reason of this gravity effect, while not open to the objections inherent with direct radiation when placed against the outside walls. These objections are that the direct radiation interferes with the benches of the workmen, causes local overheating, and is not economical of fuel, since there is an opportunity for a large amount of radiant heat to enter directly the outside wall without appreciably affecting the temperature of the room. The air is handled by steam power, and the cost of air handling is included in the fuel cost.

The Detroit plant, with its direct radiation, is, of course, heated whenever supplied with steam.

In order that some idea may be obtained of the relative costs of operating the two plants, a careful record was made of the fuel consumed during the season of 1913-14.

The following is the governing data:

	Toledo with ventilation.	Detroit no ventilation.
Exposed glass surface...	39,520*	13,980*
Exposed wall surface.....	7,904*	2,796*
Exposed concrete column surface	7,680*	2,796*
Exposed roof surface.....	45,880*	3,600*
Exposed ground floor surface	45,500*	3,600*
Contents .....2,460,500†		704,592†
Floor area	178,800*	56,955*
Blast radiation	12,983*	
Direct radiation .....negligible		8,905*
Air delivered per minute.	138,000†	
Boiler capacity	500‡	125‡
Cost of coal per season...	$3,009.00	$952.00
Fuel cost for heating and ventilating per 1,000 cu. ft. of contents per season	$1.22	$1.35
Same per thousand sq ft. of floor space per season	$16.82	$16.73

*Square feet.
†Cubic feet.
‡Horse power.

So far the evidence is favorable to a blast system as indicating that a large, well built, factory building can be heated and ventilated with an efficient, all indirect plant for less cost per thousand cubic feet of space per season and for nearly the same cost per thousand square feet of floor space, per season, as it can be heated alone for by plain direct radiation.

GREATER HEIGHT OF TOLEDO PLANT FAVORABLE TO FUEL ECONOMY.

Such a conclusion on the data given is not fair, however, and the reason for the apparent greater economy of the Toledo plant lies in the more economical construction of the building; that is, the Detroit building being but two stories high loses heat through the floor of the first floor and through the ceiling of the second floor, whereas the Toledo building, being four stories high, has two intermediate stories which only lose heat around their edges. This advantage is sufficient in the instance under consideration to make a favorable showing for the blast system.

If, however, we compare the cost per hundred thousand heat units lost per hour (from the theoretical computations using the same factors for each building for zero outside) we find that the Toledo plant cost 65 cents where the Detroit plant cost but 42.8 cents.*

It is apparent that owners should consider more earnestly than is apparently their custom, the effect of cold exposure in heating cost.

I believe we can conclude fairly that an increase of 35 per cent. in the fuel cost of heating alone for the addition of good ventilation, is a justifiable expenditure and that the difference in price will prove to be more nearly 35 per cent. than 100 per cent. as is often loosely stated.

The following extracts are made from letters written by the owner of each building in March, 1914, in order to show that both plants were heating the buildings adequately and satisfactorily:

TOLEDO.

"Our tenants are very enthusiastic over the heating conditions of the building. The building has been at 70° at 7 o'clock each morning throughout the heating season when the outside tempera-

*Editor's Note.—In the ensuing discussion of this address, at the suggestion of M. W. Franklin, Mr. Lewis coined the term "cost per 100,000 heat unit years" as a convenient way of expressing the cost of heating a building for an entire year on the basis of the B. T. U. used.

tures during the day-time have been as low as 3 and 4° below zero.

"We have yet to have any complaint from any of the tenants about the building being insufficiently heated. Indeed about a month ago, during the severe cold weather, we made a test of the conditions immediately next to the glass surfaces of our most exposed room—the temperature in the center of the room was 70°; the temperature one foot from the glass was 60°."

DETROIT.

"Our heating system, we are very glad to say, has proven quite adequate to take care of us in the severest weather. As to advising whether the two floors equalize in radiation, this we have not followed very closely. There has been no complaint and it would be probably hard for us to determine, as we have a number of firepots on our main floor and the heat from these would probably make some little difference."

The Detroit plant makes automobile radiators and sheet metal accessories.

When buildings are heated by central station steam systems, it is easy to determine the cost of heating them. At Aurora, Ill., the Y. M. C. A. building, heated continuously, of a reasonably good character of construction, gives us the following information:

The plant cost for heating, on the basis of a sliding scale price for steam, as follows—winter 1912-13:

		Percentage of total each month.
October	$ 43.12	6%
November	77.52	13%
December	84.36	14%
January	140.22	23%
February	100.32	18%
March	90.20	15%
April	57.62	9%
May	14.63	2%
Total	$607.99	100%

The total heat loss per hour is 608,000 B.T.U. computed for an outside temperature of 10° F. $\frac{608,000}{966} = 639$ lbs. of water per hour.

If the season were cold throughout, we would theoretically require (24 hours per day) × (210 heating days) × (639 lbs. per hour) = 3,220,560 lbs. of steam per season. The plant did condense 1,013,720 lbs. of steam, as of course the maximum condensation occurred but a very small part of the total time.

We may apparently safely deduce from this that instead of figuring arbitrarily 16 hours per day, as is a general custom, instead of 24 hours per day, we can figure the 24 hours and then multiply the result by a percentage. This percentage for the latitude of Chicago is $\frac{1,012,720}{3,220,560} = 31.4$, say 32 per cent.

By using the monthly percentages given above, the cost of heating for any month is obtainable after the total season cost has been computed.

The theoretical loss from the building was based on the following general factors, without any percentages added for points of the compass or leakage.

"K" constant for 1 sq. ft. of various building exposure surfaces, representing the B.T.U. loss per hour per degree difference between the inside and outside temperatures:

BRICK WALLS:

Furred (K).	Bare (K).
8 in.—0.46	8 in.—0.23
12 in.—.0.33	12 in.—0.21
16 in.—0.27	16 in.—0.19

Cement floor on ground, K = 0.31.

Top floor ceiling with shallow attic, K = 0.15.

Single window, K = 1.20.

Single skylight, K = 1.50.

These are published, more elaborated, by the American Blower Co. of Detroit.

A Pressure Survey Study Constituting a Report on the Comparative Use of Exhaust and Live Steam for Heating

By C. C. WILCOX.
Engineer Hodenpyl, Hardy & Co., Jackson, Mich.

The investigation, of which this is a report, has grown out of a series of experiments carried on by the Central Illinois Light Company, under the general supervision of the writer and under the direct supervision of G. C. Daniels. These experiments were originally started with the idea of making an analysis and study of the pressure conditions in the Peoria, Illinois, steam heating system.

For the most part, a complete system of records is kept, which shows all of the principal operating details, in regard to the heating system; but in addition to these records, a number of days have been selected for the taking of the additional data, which would determine quantitatively the benefit derived by the reduction of station pressure, caused by the installation of additional pipe line capacity

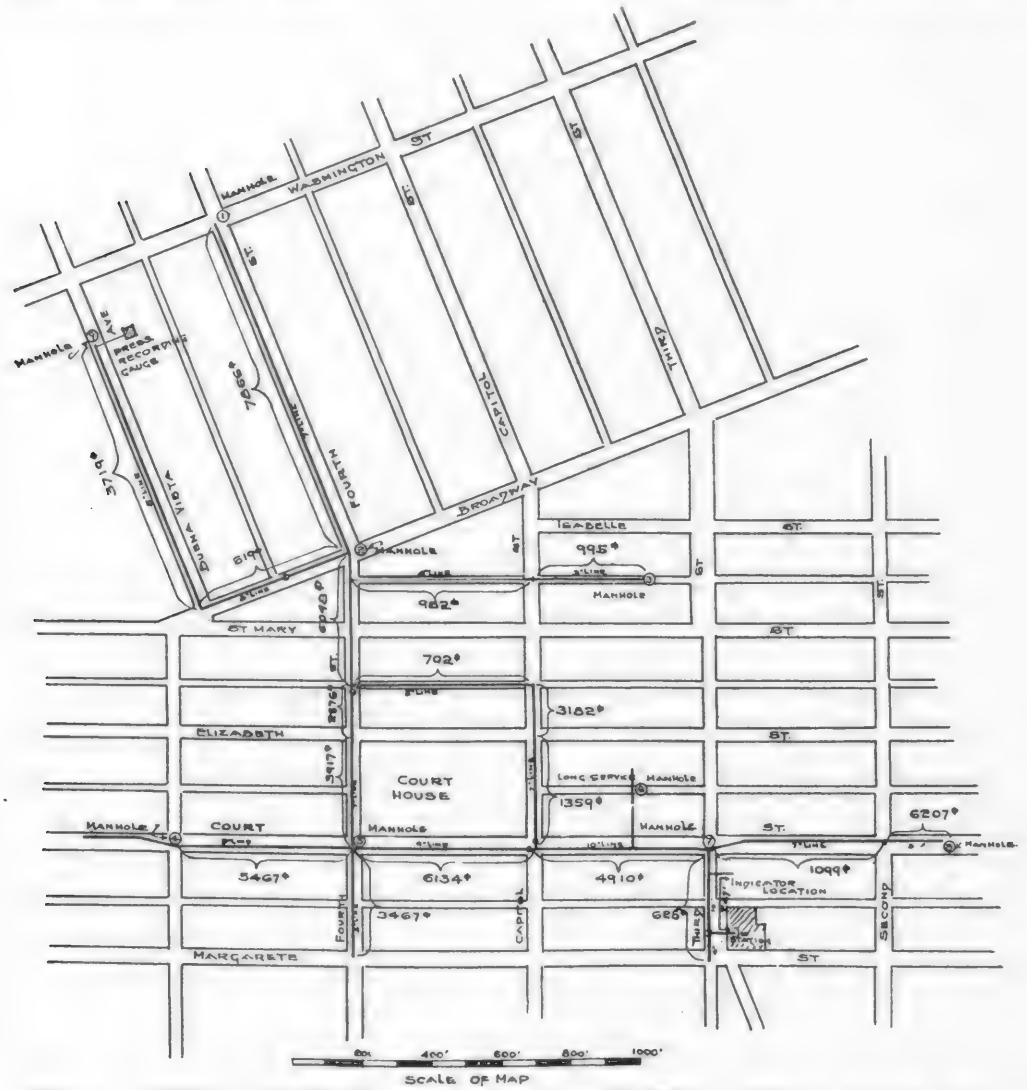


FIG. 1.—CENTRAL PORTION OF PEKIN, ILL., SHOWING POWER HOUSE AND HEATING MAINS.

from the station. Before proceding very far with this work, it was found that so many variables existed that certain of them should be studied more in detail. One of these conditions was the relative effect upon the pressure in the system experienced by the use of live or exhaust steam; and in order to investigate this particular phase of the subject more thoroughly, the Pekin, Illinois, heating system was selected as the one most favorable to this work.

This property is about ten miles down the Illinois River from Peoria, and is connected to Peoria by an electric transmission line. Ordinarily the heating load is "floated" on the transmission system, i. e., just enough current is generated in the Pekin power station to furnish sufficient exhaust steam to meet the demands of the heating system.

Fig. 1 is a map of the central portion of Pekin, showing the location of the power station, with reference to the heating system, and to the center of the town, which is located principally on the four sides of the courthouse square.

At the time these tests were run, there was connected to the system 60,174 sq. ft. of heating surface, giving a heating surface in mains of 12,696 sq. ft. The cubical contents heated was 4,355,744; number of services, 101; square feet of pipe surface in services, 4,692.

The system consists entirely of wood-log and variator construction.

Fig. 2 shows the arrangement of the power station building. The proper location of all of the units of apparatus is shown, but the piping diagram is slightly re-arranged in a schematic manner, in order to make the connection more easily followed.

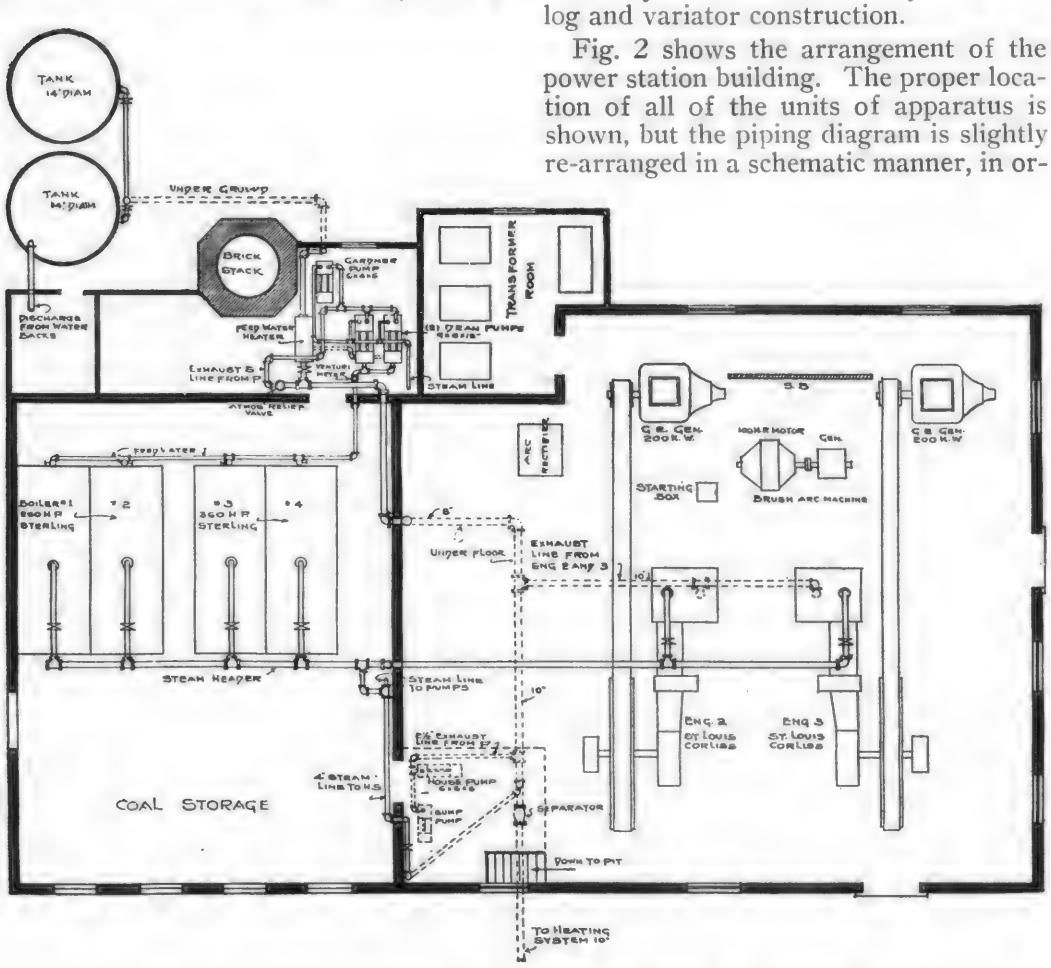


FIG. 2.—ARRANGEMENT OF POWER STATION AT PEKIN, ILL.

Engine No. 1 is not shown, as this engine is not connected up. Engines 2 and 3 are the ones used for supplying heat to the heating system, and are St. Louis Corliss engines, size 22x42, running at

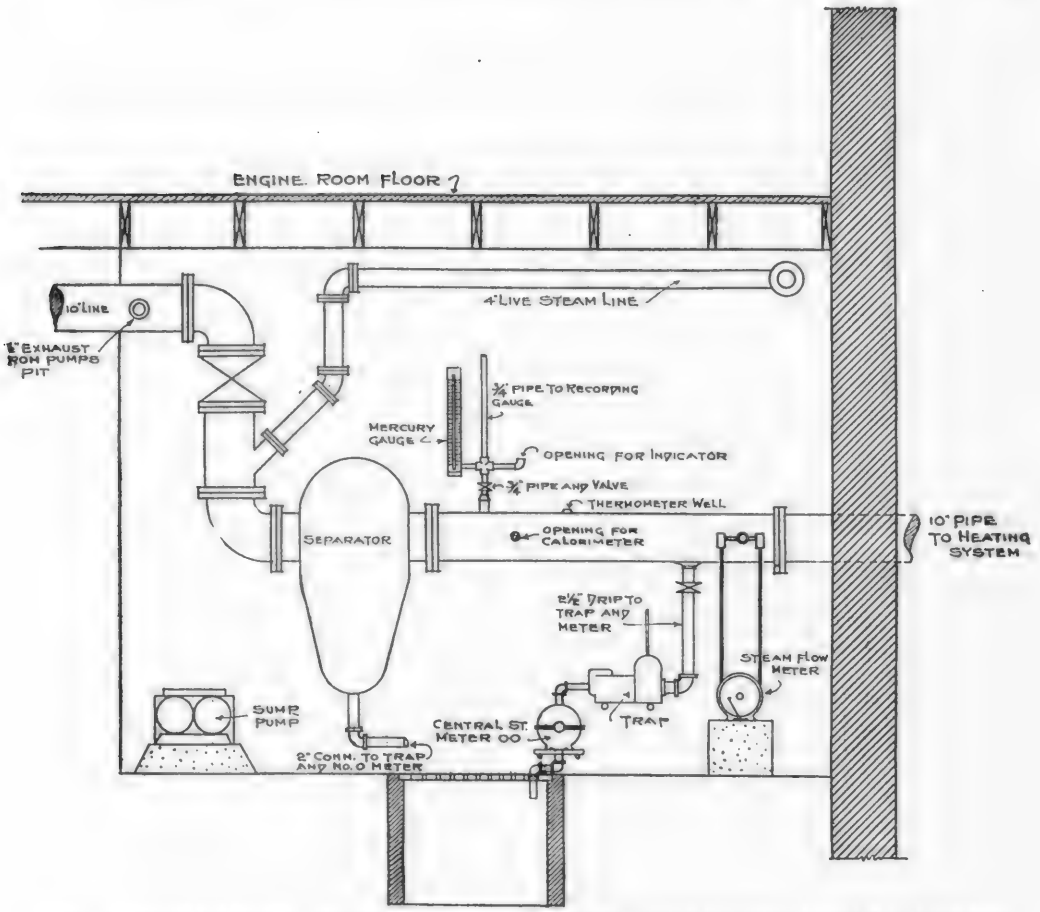


FIG. 3.—ELEVATION OF PIT IN BOILER ROOM CONTAINING DUPLEX PUMPS, CALORIMETER, ETC.

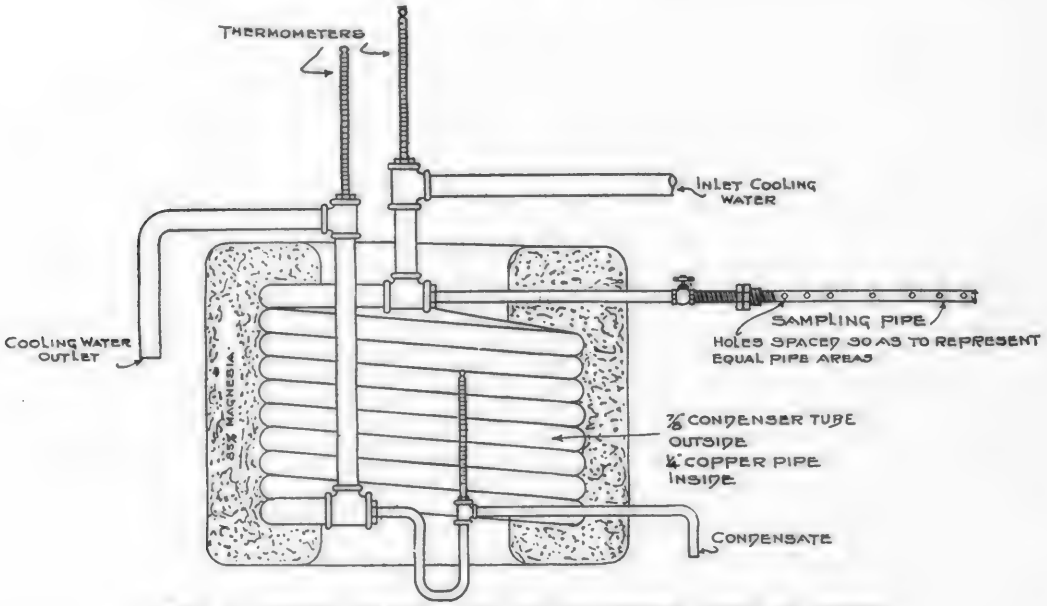


FIG. 4.—CROSS SECTION OF CALORIMETER USED IN TESTS.

83 R. P. M. They are belted to A. C. generators. They are rated at 300 h.p. at 100 lbs. of steam at the throttle.

In the engine room basement, next to the boiler room wall, is shown the pit, in which are located two duplex pumps. It was in this pit that the calorimeter and other apparatus used during the tests, was located.

Fig. 3 is an elevation of the pit referred to in the paragraph above, and shows the general arrangement of the apparatus used during the tests. For the sake of clearness, the calorimeter has not been shown in this drawing, but a separate drawing has been prepared for it.

Fig. 4 shows a cross section of the calorimeter which was used for determining the quality of the steam going out to the heating system. This calorimeter consisted of two concentric tubes, the outer one being a ⅞-in. condenser tube, and the inner one a ¼-in. copper pipe. The cooling water circulated through this coil between the ¼-in. pipe and the condenser tube, the steam passing through the ¼-in. pipe. The temperature of the cooling water was measured as it entered and as it left the coil, and the temperature of the steam was taken as it entered and as it left the coil. A "U" bend was placed in the outlet for the steam condensate to keep the thermometer bulb submerged.

The calorimeter was located as closely to the 10-in. heating main as possible, and was thoroughly lagged, both inside and out of the coil, with 85% magnesia covering. The steam connection from the heating main to the calorimeter was also thoroughly covered.

The holes in the sampling pipe, which was used to collect the steam samples for the calorimeter, were spaced at unequal distances apart, these distances being calculated so that each one represented a certain equal area of the pipe, the cross-section of the pipe being divided by a number of imaginary concentric circles making equal area divisions. The sampling tube was placed in the steam pipe horizontally.

The cooling water entering the calorimeter was caught and weighed in a barrel. The steam condensed in the calorimeter was also collected and weighed; and from these weights, in connection with the temperatures of the incoming and outgoing cooling water, and the steam temperatures, the quality of the steam going to the heating system was calculated.

The flow of steam to the heating system was taken by a General Electric Company's type F steam flow meter. The pressure of steam in the heating main was taken by a recording pressure gauge, which was checked by a mercury gauge.

The heating main leaving the station drains backward to the station, so that it was thought necessary to install a drip connection to prevent condensed steam from flowing backward in the pipe and vitiating the calorimeter readings, and the readings of the moisture removed by the separator. A trap and meter, as shown in Fig. 3, were placed on this drip connection, and readings of this meter were taken during the test. It was found, however, that no condensation was returned to the station through this drip connection.

The opening for the calorimeter was placed as close to the separator as practicable, in order to find a location in the pipe where the steam was agitated as much as possible, in order to secure an average sample. It is thought that in this way it was impossible for any large amount of condensation or moisture in the steam to precipitate to the bottom of the pipe after it had passed the separator, and before it came to the sampling pipe and to the calorimeter.

In order to determine how great the pulsations in pressure were at the station, an indicator was located on the pressure connection, as shown in Fig. 3, and cards were taken at this point with a 4-lb. spring. In Fig 5 is shown the result of this test. Curves a, b, c and d.

This indicator was then taken to a point about 250 ft. from the station, on the first service taken off from the steam main, to see whether the variations in pressure resulting from the engine pulsations were carried for any distance along the main. The results of this test are also shown on Fig. 5. Between these two stations where indicator cards were taken, i. e., at the power house and at the first service, there was 200 ft. of 10 in. pipe as steam main, and 47 ft. of 2½ in. pipe as service. It is to be noted that almost no fluctuations in pressure could be

detected at the service, with the engines either in or out of step. On the first curves shown in Fig. 5, the amplitude of these pulsations varies from a small quantity to a maximum of about ¾-lb. This is due to the fact that the engines are belted to generators, and due to the difference in belt slippage, the engines gradually pass into and out of periods of synchronism. The variations of pressure due to these pulsations, as recorded by the indicator at the end of the service, were so small that no difference could be detected between the conditions of the engines being in synchronism or out of synchronism, consequently only one curve is reproduced (Curve e).

It was the intention to measure the pulcations in the *flow* of steam under these conditions—i. e., to determine if the *velocity* of steam leaving the station varies the same as the pressure, and also if this variation in the flow of steam is carried out into the pipe. It is thought, however, that the almost entire absence of any pulsation in pressure, at so close a distance to the power station, would indicate that the flow of steam is sensibly uniform throughout the system; at least, does not vary according to the pulsations produced by the engine exhaust.

PRINCIPAL RESULTS TAKEN FROM TWO TESTS.

The principal results presented herewith are taken from two tests, made on March 1 and March 2, 1915, to determine the difference in various results incident to the use of live and exhaust steam. The two days chosen were almost identical in weather conditions, as is shown by the temperature, relative humidity and wind velocity. Both days were sunshiny and so far as is known, the conditions throughout the heating system were identical. A large number of tests had been made previous to these days, but it was very difficult to find two consecutive days in which the weather conditions were identical, and on which the tests could be carried out without interruption of any kind. The two days chosen were rather remarkable in that respect and are the only days for which the results are reproduced. The results of these two days' tests are shown in tabular form.

The Send-Out Analysis shown at the end of this table is not intended to be a strict heat balance, but was calculated principally to show the distribution of steam under the two different conditions. In this connection, attention is called to the fact that the total B. T. U. sent to the heating system above feed water temperature in the two cases is very nearly the same, being 77,071,000 in cases of exhaust steam, and 74,661,000 in the case of live steam. It is also to be noted that the per cent. heat unaccounted for is greater in the exhaust steam run than in the live steam run. This can be mostly accounted for by the greater amount of piping involved in the test, and the consequent greater possibility for leakage, etc. In this analysis, the heat sent to the heating system was calculated above boiler feed water temperature. This temperature was taken for several reasons—it is a measure of the performance of the

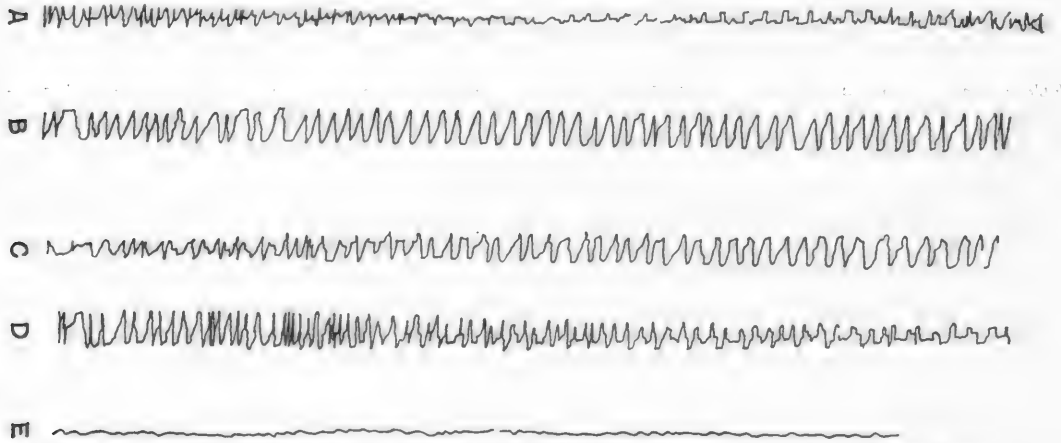


FIG. 5.—RESULTS OF TESTS TO DETERMINE PULSATIONS AT STATION AND AT A DISTANCE OF 250 FT.

boilers, and at the same time is approximately the temperature at which the steam is discharged from the customers' installations.

The figure of 4 per cent. moisture, used in the calculation of the test, is the average of fifteen determinations taken on various days. In these tests, the temperature of the entering and leaving cooling water remained practically constant, showing that the moisture remained constant. The variations in the results are due to the inability to read the temperature and weight closely enough, with the apparatus which was used. An error of 1 per cent. in the weight of the condensate or cooling water or any of the temperature readings, results in an error of slightly over 1 in the quality expressed in per cent.

The figure of 4 per cent moisture above was used rather than the figure for March 1 and 2 only because of the fact that it is impossible to make determinations rapidly enough to get many results in an eight hour run. There were no conditions which would vary the moisture in the steam from day to day; consequently, the average for all of these days is thought to be more nearly the average moisture for the days of the test than the results of these days only. For this reason, the average of a number of determinations was taken rather than those taken on just the days of March 1 and 2.

Fig. 6 shows the plot of a two days' continuous test taken on pressure readings with steam flow to heating system, which shows in a very interesting way the effect of a change from live to exhaust steam and vice versa, upon the pressure drop between the station and the end of the line. It is to be noted in this connection that the pressure drop decreased from 3.4 lbs. to a little under 3 lbs. at the time of changing over from exhaust to live steam;

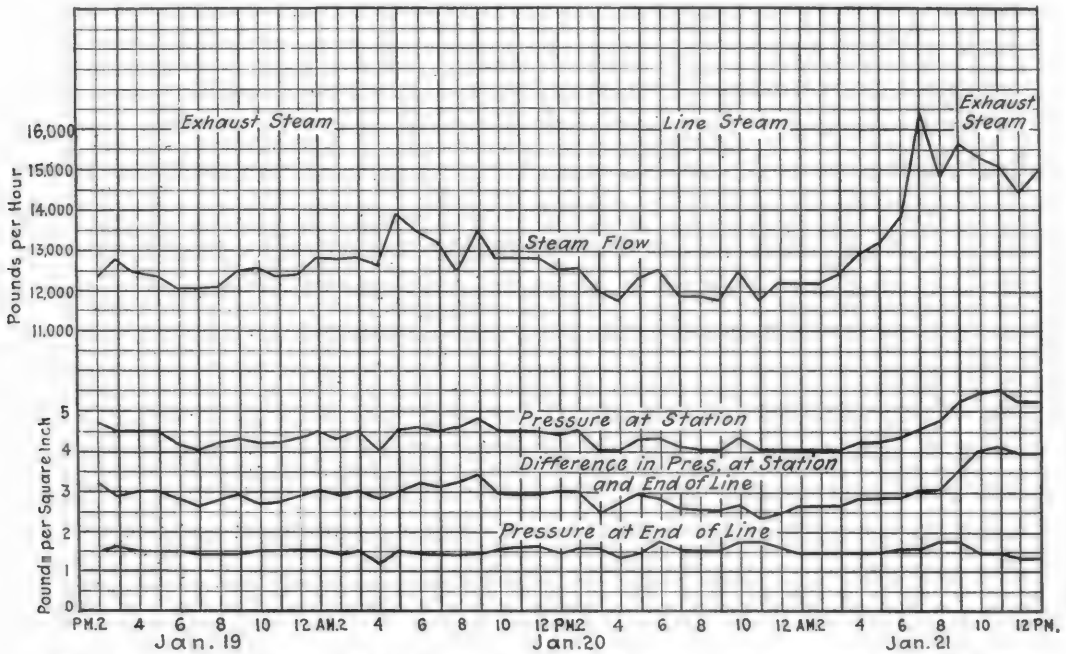


FIG. 6.—PLOT OF TWO DAYS' TEST, SHOWING EFFECT OF CHANGE FROM LIVE STEAM TO EXHAUST STEAM.

and again changed from 3.55 lbs. to 4 lbs. upon changing back again to exhaust steam operation.

Occasionally station operators make the statement that the fuel burned or the heat required is increased in changing over from exhaust to live steam. While in certain cases this may be true, still, the tests shown below indicate that if care is taken to keep the pressure at the end of the line, or at least the average pressure throughout the system, the same, the send-out will not be increased. The fact

that it is increased is thought to be an indication that the live steam in the mains has raised the pressure in the mains, and consequently has increased the rate of condensation throughout the system; and from this observation it has been erroneously concluded that it requires more live steam to do a certain amount of heating than it does exhaust steam. The tests, as shown herewith, indicate, if a like amount of heating is accomplished that it requires no more live steam than exhaust steam to do it—in fact, the indications are just the reverse. The following is a digest of the principal results obtained:

COMPARISON OF EXHAUST AND LIVE STEAM.

The following percentages show the effect of changing from live to exhaust steam operation, calculated as a percentage of live steam conditions:

1. Per cent more steam to heating system 10.00
2. Per cent more heat to heating system 3.23
3. Per cent less heat per lb. of steam to H. S..... 6.23
4. Per cent more heat in coal fired 24.20
5. Per cent more heat in total steam generated 27.10
6. Per cent more main condensation 7.23
7. Per cent increase in pressure drop between station and end of line 30.90

These tests indicate that:

(a) The heat consumption for a heating system under similar weather conditions is practically the same for either live or exhaust steam operation.

(b) That the weight of steam sent to the heating system is increased as the heat content of the steam is diminished.

(c) That the carrying of an electric load in addition to the heating load can not be accomplished without an increase in fuel.

(d) The main condensation with live steam is less than with exhaust steam.

(e) The pressure drop between station and end of line is more with exhaust steam than with live, which is largely accounted for by the increased amount of send-out when using exhaust steam.

(f) Pulsations in pressure caused by the engine exhaust are not propagated very far from the source.

TEST DATA

General.		
Kind of steam	Exhaust	Live
Date	March 1, 1915	March 2, 1915
Time of day	8 a. m.—4 p. m.	8 a. m.—4 p. m.
Duration in hours	8 hours	8 hours
Weather	Clear	Clear
Ave. outside temperature, Deg. F	40.1	39.1
Ave. wind velocity, miles per hr	5.3 West	4.1 West
Ave. relative humidity, per cent	78	74
Pressures.		
Ave. boiler pressure, lbs. gauge	117	119
Ave. pressure in heating main at station, lbs. gauge	4.15	3.30
Ave. presure in heating main at end of line, lbs. gauge	1.40	1.20
Ave. drop in pressure from station to end of line, lbs.	2.75	2.10
Temperatures.		
Temperature make up water, Deg. F	58	48
Temperature feed water, Deg. F	190	192
Temperature in heating main at station, Deg. F	224	283
Coal.		
Kind of Coal	Tazewell Co. 1¼ Scrg.	Fulton Co. 1¼ Scrg.
Analysis of coal—		
Moisture	11.2	12.6
Volatile matter	27.3	23.7
Fixed carbon	39.9	36.8
Ash	21.6	26.9
B. T. U. per lb. dry coal	10,700	9,450
B. T. U. per lb. coal as fired	9,520	8,280
Total lbs. coal used	18,150	16,800

Steam and Water.		
Total lbs. feed water by Venturi meter	118,000	93,000
Total lbs. steam to H. S. by flow meter	80,400	73,040
Total lbs. steam to Calorimeter	220	60
Total lbs. condensation from separator	4,800	.....
Total lbs. steam to heat feed water	14,950	11,780
Total per cent. steam unaccounted for	14.9	8.7
Ave. per cent. of moisture removed by separator	5.62	.....
Ave. per cent. of moisture or superheat past separator	4.%	60° Sup.
Ave. per cent. of moisture or superheat before separator	9.37	60° Sup.
Ave. quality of steam leaving boiler	99%	99%
Efficiency.		
Average actual evaporation per lb. coal, as fired	6.5	5.54
Average equivalent evaporation per lb. coal, as fired	6.86	5.84
Average combined boiler and furnace efficiency, per cent.	70.0	68.4
Factor of evaporation	1.056	1.054
Combined elect. and mech. efficiency of engine and generator	80%	
Sendout Analysis.		
B. T. U. in total coal as fired	172,788,000	139,104,000
B. T. U. in total steam above feed temperature	120,891,000	95,120,000
Total B. T. U. sent to heat system above feed temperature	77,071,000	74,661,000
Total B. T. U. equiv. kw. h.	7,508,000	.....
Total B. T. U. equiv. eng. and gen. loss	1,877,000	.....
Total B T. U. to heat feed water	13,555,000	11,709,000
Total B. T. U. lost in condensation from separator	166,000	.....
Total B. T. U. lost in Calorimeter	211,000	61,000
Total B. T. U. accounted for	100,388,000	86,431,000
Total B. T. U. unaccounted for	20,503,000	8,689,000
Per cent. B. T. U. unaccounted for	17.0%	9.1%

TABLE OF RESULTS OBTAINED WITH CONDENSING CALORIMETER

Central Illinois Light Co., Pekin, Ill.

Date	Duration (min.)	Temp. Outlet, Deg. F.	Temp. Inlet, Deg. F.	Temp. in Main, Deg. F.	Steam Press, lbs.	Wt. of Condensate, lbs.	Quality	Kind of Steam
3- 4-'15	28	140.8	59.6	226.0	3.8	18.63	96.00	Exhaust
3- 5-'15	17	107.0	59.6	224.0	3.7	10.81	97.00	Exhaust
3- 5-'15	30	142.0	59.0	224.6	3.9	18.63	98.90	Exh. & Live
3- 5-'15	19.5	114.8	58.0	225.3	3.9	12.63	99.75	Exhaust
3- 6-'15	23.5	125.2	59.5	224.0	3.6	15.00	96.50	Exhaust
3- 6-'15	10	97.0	58.0	224.0	3.9	6.70	93.20	Exhaust
3- 1-'15	28	117.0	41.0	225.0	3.8	17.14	96.40	Exhaust
3- 1-'15	21	101.0	40.0	227.0	4.3	13.64	97.30	Exhaust
2-18-'15	27	110.0	40.0	?	3.8	16.13	93.30	Exhaust
2-18-'15	28	115.2	40.8	?	3.8	16.63	97.20	Exhaust
2-19-'15	20	90.3	38.0	?	3.9	12.13	92.50	Exhaust
2-19-'15	28	112.0	39.0	?	3.9	17.13	91.50	Exhaust
3-10-'15	20	132.0	58.0	224.0	3.4	12.25	98.74	Exhaust
3-10-'15	16.5	102.7	60.0	224.0	3.1	10.00	95.40	Exhaust
3-10-'15	40	173.7	60.0	226.0	4.0	24.00	95.97	Exhaust
Average quality							96.00	

$$\text{Quality or steam} = \frac{WT}{wl} - \frac{H}{1}$$

Where W=weight of cooling water
T=diff. in temp. between entering and leaving cooling water
w=weight of condensate
l=Latent heat of steam at pressure on main
H=Heat of liquid (at steam pressure in main) above temp. of condensate

Exhaust Steam January 19 to January 20.

Time.	Station Pressure.	End of Line Pressure.	Flow Meter Reading.	Steam Flow.	Difference Bet. Station & End of Line.
1 p. m.— 2 p. m.	4.7	1.5	5.20	12,300	3.2
2 p. m.— 3 p. m.	4.5	1.6	5.25	12,800	2.9
3 p. m.— 4 p. m.	4.5	1.5	5.10	12,450	3.0
4 p. m.— 5 p. m.	4.5	1.5	5.05	12,350	3.0
5 p. m.— 6 p. m.	4.2	1.5	5.00	12,092	2.8
6 p. m.— 7 p. m.	4.0	1.4	5.00	12,023	2.6
7 p. m.— 8 p. m.	4.2	1.4	5.00	12,092	2.8
8 p. m.— 9 p. m.	4.3	1.4	5.15	12,491	2.9
9 p. m.—10 p. m.	4.2	1.5	5.20	12,576	2.7
10 p. m.—11 p. m.	4.2	1.5	5.10	12,334	2.7
11 p. m.—12 p. m.	4.3	1.5	5.10	12,370	2.8
12 p. m.— 1 a. m.	4.5	1.5	5.25	12,800	3.0
1 a. m.— 2 a. m.	4.3	1.4	5.25	12,734	2.9
2 a. m.— 3 a. m.	4.5	1.5	5.25	12,800	3.0
3 a. m.— 4 a. m.	4.0	1.2	5.25	12,624	2.8
4 a. m.— 5 a. m.	4.5	1.5	5.70	13,900	3.0
5 a. m.— 6 a. m.	4.6	1.4	5.50	13,455	3.2
6 a. m.— 7 a. m.	4.5	1.4	5.40	13,200	3.1
7 a. m.— 8 a. m.	4.6	1.4	5.10	12,476	3.2
8 a. m.— 9 a. m.	4.8	1.4	5.50	13,532	3.4
Live Steam January 20 to January 21.					
9 a. m.—10 a. m.	4.5	1.55	5.60	12,798	2.95
10 a. m.—11 a. m.	4.5	1.60	5.60	12,798	2.90
11 a. m.—12 a. m.	4.5	1.60	5.60	12,798	2.90
12 a. m.— 1 p. m.	4.4	1.42	5.50	12,534	2.98
1 p. m.— 2 p. m.	4.5	1.55	5.50	12,770	2.95
2 p. m.— 3 p. m.	4.0	1.55	5.30	11,940	2.45
3 p. m.— 4 p. m.	4.0	1.30	5.20	11,714	2.70
4 p. m.— 5 p. m.	4.3	1.40	5.40	12,271	2.90
5 p. m.— 6 p. m.	4.3	1.70	5.50	12,498	2.80
6 p. m.— 7 p. m.	4.1	1.55	5.25	11,861	2.55
7 p. m.— 8 p. m.	4.0	1.50	5.25	11,827	2.50
8 p. m.— 9 p. m.	4.0	1.50	5.20	11,714	2.50
9 p. m.—10 p. m.	4.3	1.70	5.50	12,498	2.60
10 p. m.—11 p. m.	4.0	1.70	5.20	11,714	2.30
11 p. m.—12 p. m.	4.0	1.60	5.40	12,165	2.40
12 p. m.— 1 a. m.	4.0	1.40	5.40	12,165	2.60
1 a. m.— 2 a. m.	4.0	1.40	5.40	12,165	2.60
2 a. m.— 3 a. m.	4.0	1.40	5.50	12,390	2.60
3 a. m.— 4 a. m.	4.2	1.40	5.70	12,915	2.80
4 a. m.— 5 a. m.	4.2	1.40	5.80	13,142	2.80
5 a. m.— 6 a. m.	4.3	1.50	6.1	13,861	2.8
6 a. m.— 7 a. m.	4.5	1.50	7.2	16,454	3.0
7 a. m.— 8 a. m.	4.7	1.70	6.4	14,740	3.0
8 a. m.— 9 a. m.	5.25	1.70	6.7	15,640	3.55
Exhaust Steam January 21 to January 22.					
9 a. m.—10 a. m.	5.4	1.4	6.1	15,263	4.0
10 a. m.—11 a. m.	5.5	1.4	6.0	15,055	4.1
11 a. m.—12 a. m.	5.2	1.3	5.8	14,432	3.9
12 a. m.— 1 p. m.	5.2	1.3	6.0	14,929	3.9

CONDENSATION IN MAINS.

	Exhaust Steam	Live Steam		Exhaust Steam	Live Steam
Electric Station Drip Connection	0	0	Manhole No. 7.....	600	800
Manhole No. 1.....	0	100	Manhole No. 8.....	400	500
Manhole No. 2.....	2900	1700	Manhole No. 9.....	1200	1700
Manhole No. 3.....	1300	1300	Total	8800	8200
Manhole No. 4.....	1600	700	Lbs. per hr.	.1100	1025
Manhole No. 5.....	700	1300	Lbs. per sq. ft. pipe surface per hr....	0.063	0.059
Manhole No. 6.....	100	100			

Heat Emitting Capacity of Radiation.

By CHARLES D. ALLAN.

In THE HEATING AND VENTILATING MAGAZINE for March, 1915, there appeared an article entitled "Heat From Radiators Under Different Temperatures," by Chas. A. Fuller, which contained information of unusual interest on this subject.

In this article Mr. Fuller shows clearly that the coefficient of heat transmission through heating surface varies with the temperature difference between the circulating medium and the surrounding air, as well as with the type of radiation.

Table No. 1 is a reproduction of a part of the data given in the article quoted, with some rearrangement to serve the purpose in hand, the column giving the values of W having been added.

TABLE NO. 1.

38 in. 2 col. cast-iron radiation.

T—T′	K	W=K(T—T′)
100	1.485	148.5
110	1.515	166.7
120	1.550	186.0
130	1.590	206.7
140	1.635	228.9
150	1.665	249.8
160	1.710	273.6
170	1.745	296.7
180	1.770	318.6

In this table

T = Temperature of circulating medium in degrees F.

T′ = Temperature of surrounding air assumed to be 70 degrees.

T—T′ = Temperature difference between circulating medium and surrounding air.

K = Coefficient of heat transmission expressed in B. T. U. per hour per square foot per degree of temperature difference between circulating medium and surrounding air.

W = Total B. T. U. transmitted per hour per square foot of heating surface = K (T—T′)

It occurred to the writer that there is probably some definite law governing the relation betwen T—T′ and W which might possibly be determined by plotting the relative values of each on logarithmic paper, and which in turn would enable a simple chart to be made by means of which the total heat transmission for all kinds of radiation and all values of T—T′, within practical working limits, could be directly read.

In the chart accompanying this article vertical distances are the logarithms of T—T′ and horizontal distances are the logarithms of W, both laid off to the same scale.

Nine points, clearly shown on the chart, are obtained by plotting the relation between T—T′ and W, as given in Table No. 1, for 38 in. 2 column radiation and these points come almost in a straight line that makes an angle of about 37¼ degrees with the horizontal.

Now the equation of a straight line, referred to rectangular co-ordinates, takes the form

(1) $y = mx + b$

in which m is the natural tangent of the angle with the horizontal and b is the intercept on the vertical axis.

As the natural tangent of 37¼ degrees is 0.76 we find by substitution that the logarithmic equation betwen T—T′ and W, as represented by a straight line passing through the points located, is

(2) $\log (T—T') = 0.76 \log. W + \log. C$

and the natural equation would be

(3) $T—T' = CW^{0.76}$

Normal conditions of operation may be designated as an average temperature of the circulating medium of 220° for steam systems, and 190° for water systems, the room temperature being 70° in each case, which would make T—T′ 150° in the former and 120° in the latter. The two heavy lines across the chart, respectively marked for each, represent these conditions.

Table No. 2, also compiled from the data in Mr. Fuller's article, gives the relative values of (T—T′), K and W for different kinds of radiation, with steam under normal conditions.

TABLE NO. 2.

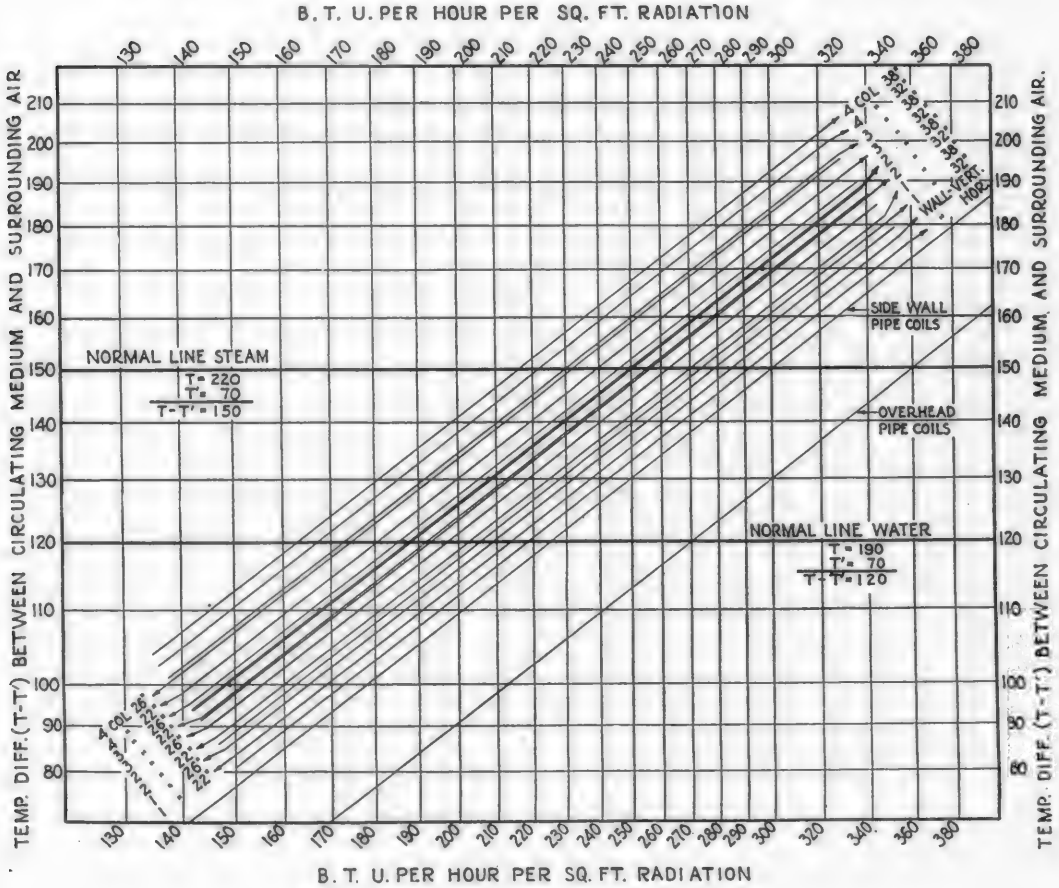
(T—T′) = 150° F. Throughout.

Radiation	K	W=K (T—T′)
4 col. — 38 in.	1.45	217.5
" " 32 "	1.50	225.0
" " 26 "	1.55	232.5
" " 22 "	1.60	240.0
3 " 38 "	1.54	231.0
" " 32 "	1.60	240.0
4 col. — 26 in.	1.65	247.5
" " 22 "	1.70	255.0
2 " 38 "	1.67	250.5
" " 32 "	1.71	256.5
" " 26 "	1.75	262.5
" " 22 "	1.80	270.0
1 " 38 "	1.80	270.0
" " 32 "	1.83	274.5
" " 26 "	1.86	279.0
" " 22 "	1.90	285.0
Wall, Vertical	1.90	285.0
Wall, Horizontal	1.95	292.5
Pipe Coils, Side	2.00	300.0
Pipe Coils, O. H.	2.40	360.0

If the same law holds good for different types of heating surface, then the values of W given in Table No. 2 can be laid off along the "Normal Line for Steam" and lines drawn through these points, parallel to the line for 38-in. 2-column radiation, will determine the equations between W and T—T′ for each kind of surface.

Equation (3) then shows a very sim-

CHART SHOWING HEAT EMITTING CAPACITY OF RADIATION



ple relationship between these quantities, being the same in form throughout except that C is constant for only one type of surface, which is self evident, as parallel lines of the same slope will each have a different intercept on the vertical axis.

The chart as constructed will be found sufficiently accurate for all practical purposes.

Window radiation has been omitted by reason of incomplete data as to the values of K for different heights, and a line for overhead pipe coils has been added, on the basis of 360 B. T. U. per hour with steam under normal conditions.

With this latter type of heating surface none of the individual pipes are enveloped in the heat of those below, as in side wall coils, and some engineers claim for them a heat delivery as high as 400 B. T. U. per hour per square foot.

Pulverized Coal for Steam Making.

The recent discussion of the use of powdered coal at the convention of the National District Heating Association and the prophecies made by several of the speakers that its use was shortly to become standard practice in central station heating work, lends special interest to the symposium on powdered fuel which was a feature of the 1914 spring meeting of the American Society of Mechanical Engineers.

The papers presented at that meeting included the following: "Pulverized Coal Burning in the Cement Industry," by R. C. Carpenter, Ithaca, N. Y.; "Pulverized Coal for Steam Making," by F. R. Low; and "An Installation for Powdered Coal Fuel in Industrial Furnaces," by William Dalton and W. S. Quigley. There was also a topical discussion upon the construction and operative features of pulverized fuel plants.

In Mr. Low's paper on "Pulverized Coal for Steam Making," he stated that numerous attempts have been made in the past quarter century to use pulverized coal as a boiler fuel. The published accounts of the various trials are full of promise and apparent accomplishment, but few of the processes have persisted, and only a small proportion of the coal used in steam making is fired in this way.

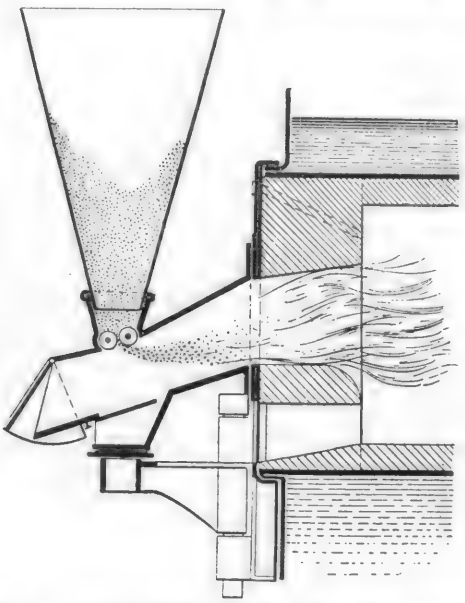


FIG. 1.—PINTHER TYPE OF APPARATUS.

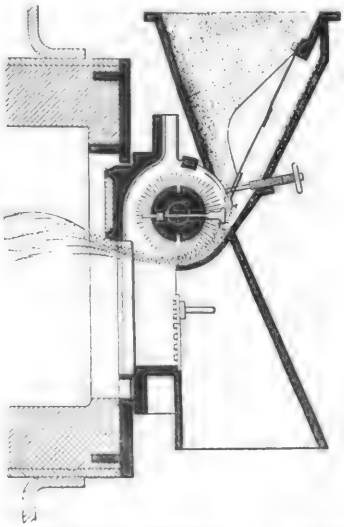


FIG. 2.—SCHWARTZKOPFF APPARATUS.

There have been three broad types of apparatus produced; that of which the Pinther (Fig. 1) is typical, where the prepared coal is emptied into a hopper above a feed-controlling mechanism and carried into the furnace by the natural draft; that having a mechanical feed, as the revolving brush of the Schwartzkopff apparatus (Fig. 2); and that in which the coal is blown into the furnace, as in the Day or Ideal apparatus (Fig. 3).

With the first type efficiencies of from 75 to 80% were obtained, but the capacity was limited. When sufficient draft was applied to introduce a considerable amount of fuel, the velocity was such as to carry

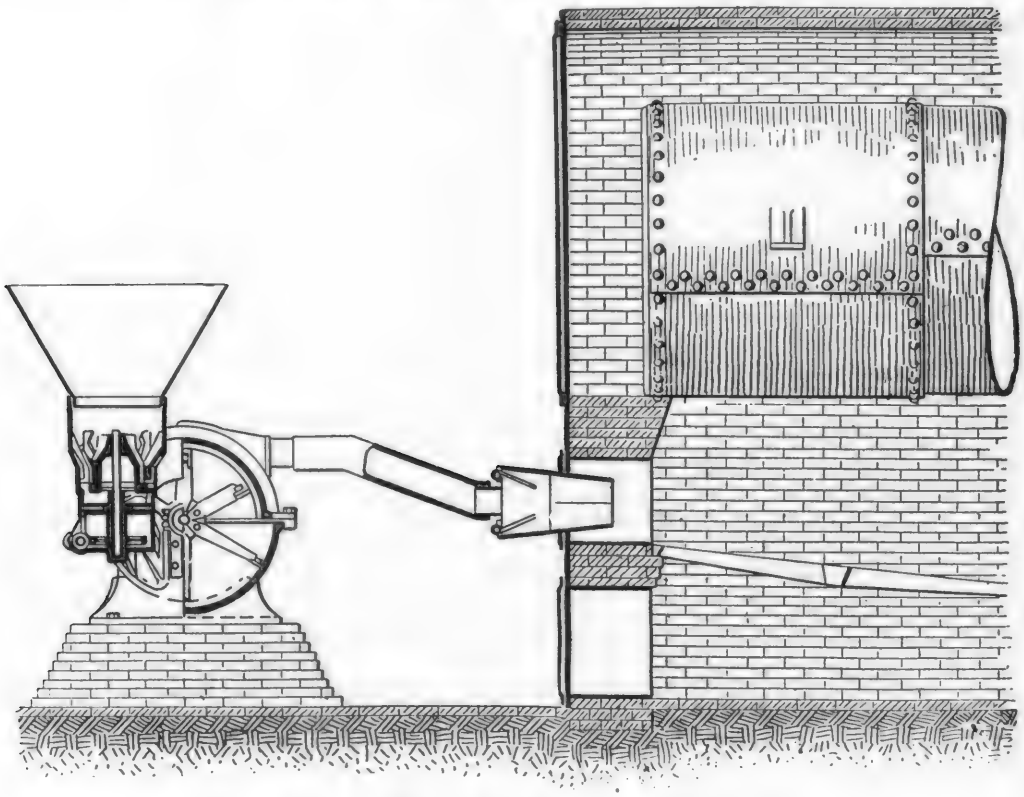


FIG. 3—DAY OR IDEAL APPARATUS.

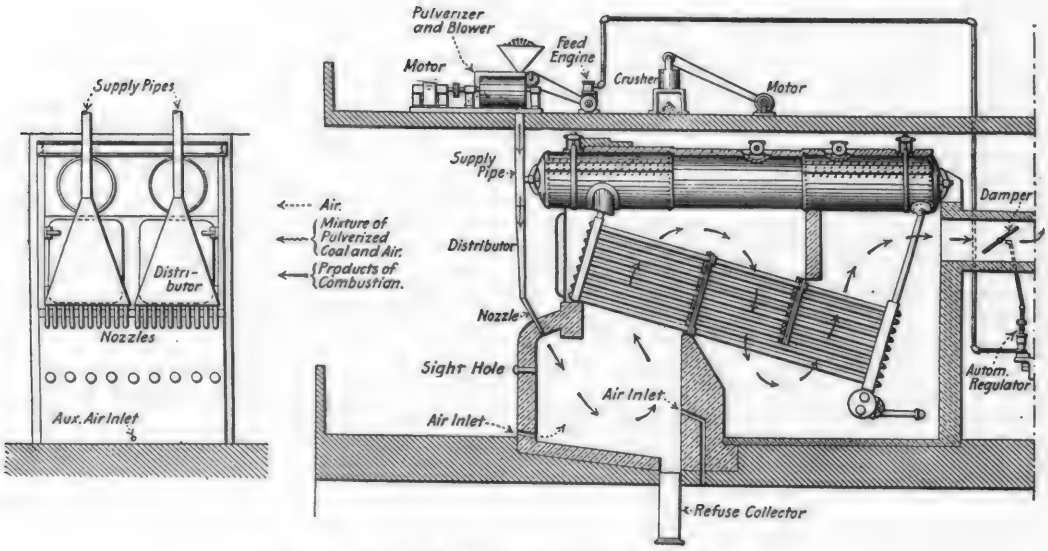


FIG. 4—BLAKE AND PHIPPS INSTALLATION.

unconsumed particles of coal into the back connection and tubes. When fuel is introduced into a powdered fuel furnace at a rate which will give the full rated capacity of the boiler, a particle will remain in the combustion zone of an ordinary furnace less than half a second.

When it is suggested that an air blast be used to introduce the fuel, the apprehension of an excess of air is natural. The relative volumes of equal weights of coal and air are about 1:990. It would hardly be expected to use less than 15 lb. of air per pound of coal, so that the relative volumes of coal and air introduced would be

$$1:(990\times15)=1:14{,}850.$$

The diameter of the globe of air which would accompany each tiny particle of fuel into the furnace would be $14{,}850^3\ \sqrt{14{,}850}$, or over 24 times the diameter of the particle of coal, so it will be seen that plenty of air may be used for fuel injection purposes without exceeding the supply required for complete combustion. In all of the systems at present in use, the fuel is introduced in this way, the blower usually being so combined with the pulverizer that the pulverized coal is blown into the furnace as fast as it reaches the necessary degree of fineness.

In 1910, J. E. Blake, of the Blake Pulverizer Co., installed, under a 300-H.P. water-tube boiler, at the Henry Phipps power plant in Pittsburgh, the arrangement shown in Fig. 4. The pulverizer served as its own blower, sending the pulverized fuel mixed with air to the furnace, where, in this installation, it was introduced by a series of nozzles extending across the width of the furnace. A little less than the rated horsepower of the boiler was obtained with an efficiency of about 79%.

A later form of the Blake apparatus was installed in the winter of 1913 at the Peter Doelger brewery in New York City. The powdered coal was delivered into the top of an extension furnace or Dutch oven, as shown in Fig. 5. Smokeless combustion and high efficiency were obtained, the principal trouble being from slag, which accumulated on the roof and sides of the furnace, and piled up in such masses upon the floor that frequent shutdowns were required

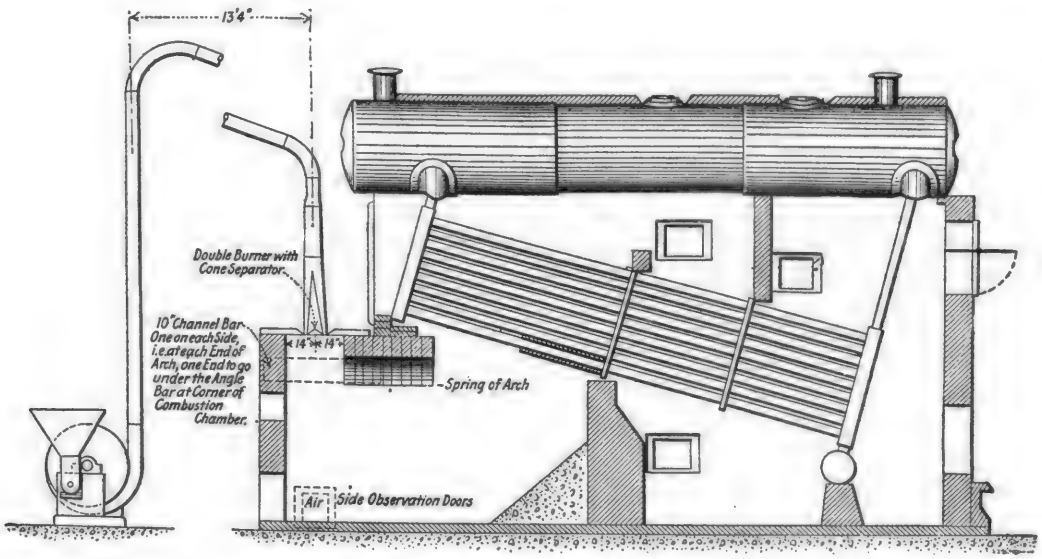

13'4"
Double Burner with Cone Separator
10" Channel Bar, One on each Side, i.e. at each End of Arch, one End to go under the Angle Bar at Corner of Combustion Chamber.
14" x 14"
Spring of Arch
Air
Side Observation Doors

FIG. 5.—DOELGER INSTALLATION.

for its removal. They evaporated as much water with 1,000 lbs. of the pulverized as with 1,400 lbs. of the natural coal, but the cost of furnace maintenance, the frequent laying off of the boiler for the removal of slag and the cost of pulverizing counteracted, in the opinion of the operators, these advantages and the system was abandoned after a trial of about eight weeks.

With the ordinary method of burning coal, the grate with its bed of solid incandescent fuel more or less encumbered with ash and clinker, offers a considerable, a varying, and an uneven resistance to the passage of air, rejects the incombustible residuum with some difficulty and allows some of the unburned fuel to sift to the ashpit or to be fused in with the clinker. If the fuel can be burned in suspension, many of these difficulties disappear and the

draft-producing apparatus is reduced to that which will remove the products of combustion and allow enough air to enter to burn the required amount of fuel. There still remains, however, the difficulty of getting rid of the incombustible. With 10% ash there will be 200 lbs. of refuse to be got rid of with each ton of coal burned. If this is kept in a pulverized form it is carried into the back connection, the tubes and stack, and scattered about the neighborhood. If it is fused it attaches itself to the surfaces of the furnace and welds itself into masses, occasioning damage to the brickwork in its removal and comparatively frequent layoffs for cleaning. In one instance the molten slag formed in sheets and ridges upon the sides and in stalactites upon the roof of the furnace, while the floor was covered with a plastic mass, which cooled when the door was opened for its removal, and could hardly be got out without material damage to the boiler.

The possibility of getting an adequate supply of oxygen to the finely comminuted carbon allows perfect and smokeless combustion with a minimum air supply, but with the rates of combustion demanded in present practice, the result is a high temperature with erosive and reducing characteristics which, however good they may be for metallurgical processes, are not favorable to the longevity of a boiler furnace. If this temperature is kept down by feeding less fuel, the capacity is limited, while if it is kept down by using an excess of air the economic advantage just cited is sacrificed.

There have been several disastrous explosions of the prepared fuel outside of the furnace; but these can be easily guarded against. Coal, however finely comminuted, does not contain the elements necessary for its own combustion, and if ignited will burn only slowly if kept in a compact mass. It is only when it is diffused in a cloud that the oxygen of the atmosphere can get to it quickly enough to make the rate of combustion dangerous. The pulverized fuel can be safely conveyed en masse in suitable holders, in screw conveyors, or even in cars and barrows if care is taken that it shall not be blown or sifted about in a finely disseminated state. In those systems where the pipe back of the blower is filled with an explosive mixture of coal and air, the rate of flow must exceed that of the propagation of flame in such a mixture, and in shutting down the coal supply should be shut off first. The pulverized mass will run like water, so that the pitch of chutes, conveyors, etc., must be so set as to provide against the flowing of their contents.

While anthracite dust can be used it burns more slowly than coal having a higher percentage of volatiles, and must be very finely pulverized. For most systems practically all of the coal should go through a screen having 100 meshes to the inch, and for coals having a small percentage of volatile or where very rapid combustion is imperative the coal is ground to a fineness which will permit the greater part of it to pass through a 200-to-the-inch sieve. Low-grade coals and coals having a large percentage of ash can be burned in this way, but there is a limit to the proportion of slate and bone that one can afford to grind, and an increasing proportion of ash means increased trouble from dust and slag. The earlier practice of taking up the impingement of the flame on a checkerwork or a heap of brickbats is out of favor. It simplifies the process of keeping the burner lighted, but burns up too much firebrick and makes a locus for the building of a slag heap. With an ordinary firebrick furnace well heated up there is no trouble in maintaining the flame steady, and it will re-ignite after having been turned out for several minutes.

The cost of pulverizing and the large initial cost of the drying, pulverizing, conveying and feeding apparatus, together with the fact that coal of practically all grades can be burned with a tolerable degree of smokelessness in the cheaper apparatus in common use with a degree of efficiency which leaves little margin to cover the increased expenditure, have combined to restrict the use of pulverized coal for boiler purposes to special instances.

Convenient Method of Sizing Returns.

The returns of a heating system may be readily sized by means of the following method:

When the steam supply is over 5 in. in diameter, the return may be one size smaller than half the diameter of the steam main. When the supply is less than 5 in., the return may be one or not more than two sizes smaller. For instance, with a main 6 in. in diameter the return main would be one-half of 6 in., or 3 in. minus one size smaller, equals 2½ in.

Building Operations for June.

An average loss of 23% in building operations in the United States is reported for June, 1915, as compared with the corresponding month last year.

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FEW actions of the National Association of Master Steam and Hot Water Fitters have been more gratifying, from many points of view, than the rescinding, at its last convention, of that clause of its "trade resolutions" which reads as follows:

"Those manufacturers and wholesale dealers who are in accord with us in this belief we look upon as our friends; our interests are mutual, and we shall use our best efforts to advance such mutual interests.

"For the information of the craft and the benefit of our friends we may, upon satisfactory evidence of the facts, print their name in our Official Bulletin, under the heading of 'List of Accord.'"

As will be seen, this limits the association's objects, as far as its dealings with manufacturers are concerned, to the following:

"The members of this association believe in trade protection. By trade protection we mean that manufacturers of, and wholesale dealers in, materials which enter into the construction of heating and ventilating systems, steam power plants and other pipe work done by those engaged in this craft, shall sell such materials for use in such work to those only who are regularly established in our line of business, and shall leave the preparation of plans and specifications to the heating contractor, the architect and the engineer. We shall endeavor by every legal and legitimate means to further trade protection."

It is to be regretted that the efforts to improve on the association's motto, "Who Helps Me, I Help," were not more successful, for this also smacks of a period that is rapidly passing away in the activities of commercial associations. Perhaps the broadest point of view is best expressed in the words of the board of directors' report:

"We shall all, no doubt, agree that we can not stand still; we must either go backward or forward and rules and regulations and even committees which may have been thought suitable to and for our association at the time of its inception may now not be in keeping with our aims and possibilities and work as at present understood."

WHILE on the subject of association work, it is perhaps an opportune time to voice the feelings of many who are fearful lest the commercial spirit gain too strong a hold on strictly engineering bodies. It is very evident that the best thought in the country is rather for a wider gulf between commercial and engineering interests than for a closer connection, and the conservative association will be the one that offers the least opportunity in this direction.

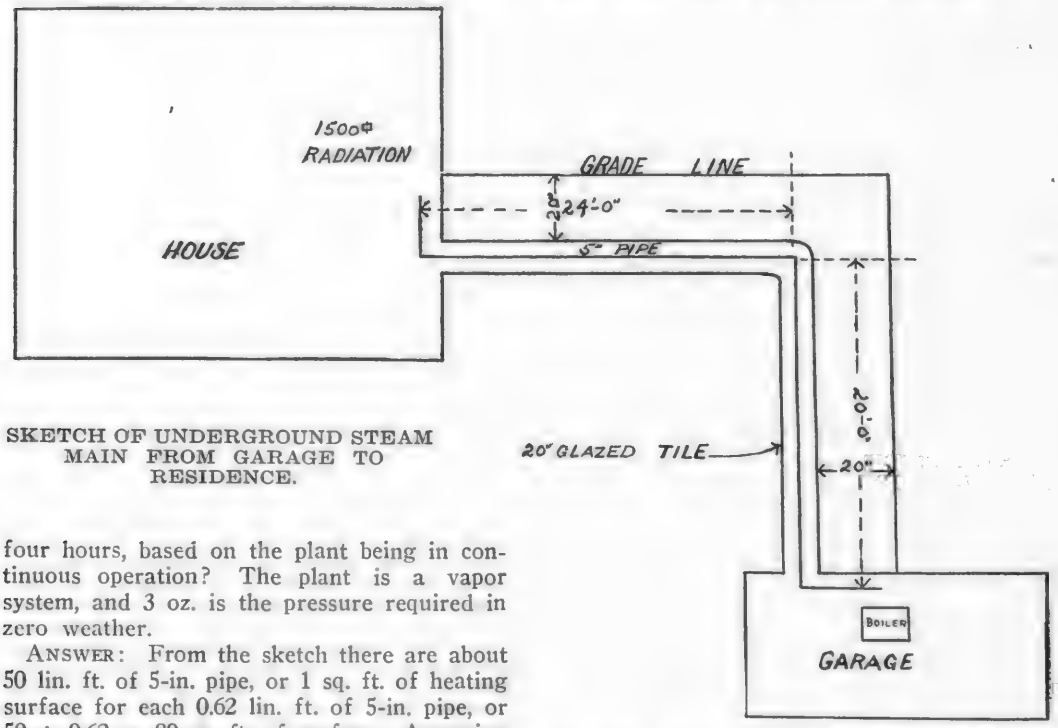
THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

CONDUCTED BY IRA N. EVANS, C. E.

48—Heat Lost from Underground Steam Pipes.

QUESTION: Referring to the accompanying sketch, which shows a main run below the water line of a boiler and dripped to the sewer, this main is covered with three-ply asbestos air cell lining and is hung in the center of 20-in. tile. There is a free circulation of warm air from the boiler room to the basement of the house through the tile. Will you be kind enough to advise me as to the amount of water lost per twenty-four hours, based on the plant being in continuous operation? The plant is a vapor system, and 3 oz. is the pressure required in zero weather.



SKETCH OF UNDERGROUND STEAM MAIN FROM GARAGE TO RESIDENCE.

ANSWER: From the sketch there are about 50 lin. ft. of 5-in. pipe, or 1 sq. ft. of heating surface for each 0.62 lin. ft. of 5-in. pipe, or 50 ÷ 0.62 = 80 sq. ft. of surface. Assuming a transmission of 1.8 B.T.U. per square foot per degree difference per hour, with an efficiency of 80% for the insulation, and surrounding air temperature of 45° F., we have, with a steam temperature of 215° F., the resulting condensation. The latent heat of steam will be 970 B.T.U. per pound.

$$\frac{80 \text{ sq. ft.} \times 1.8 \text{ B.T.U.} \times (215 - 45) \times 20\%}{970 \text{ B.T.U.}} =$$

5.05 lbs. per hour. 5.05 x 24 hours = 121.2 lbs. per 24 hours, or 1.94 cu. ft. per day. In case any of the above assumptions are not in accordance with the facts, they can be changed by the correspondent and the figures revised accordingly.

In the opinion of the author this would be bad practice, as the water lost from the boiler would entail filling at frequent intervals. If the water were wasted to the sewer, it would entail a reduction in boiler capacity due to the difference of temperature as taken from the city mains. It would be much better to lower the boiler sufficiently to provide a gravity return.

Where the water has to be supplied at such

frequent intervals it is apt to be forgotten and, with a fairly heavy fire and low water in a cast-iron boiler, when cold water strikes the hot iron, the result is a cracked section.

The free circulation of air over the covering does not improve the insulating qualities. The space should be enclosed so as to confine the air. One of the best insulators is composed of enclosed air spaces in the so-called air cell coverings.

By all means lower the boiler or provide a small motor-driven pump and receiver that will operate automatically, to return the condensation.

49—Advantage of Down-Feed Hot Water Heating.

QUESTION: Will you kindly advise me of the advantages of a down-feed hot water heating system for residential work? This system has been specified several times in house heating work in and around Boston, in houses of perhaps a little larger construction than the average. The writer cannot see what advantage this is over the regular style hot water installations.

At the same time will you advise me if it is necessary or good practice to run the feed pipes to indirect stacks in the basement (hot water) up one or two stories in a loop to get a head for circulation or will a direct connection be satisfactory? A direct connection seems to be customary with most contractors.

ANSWER: There is no advantage in using an overhead system in houses heated by hot water. The radiators are generally scattered in a building not over three stories high. A much cheaper method is to run a single pipe loop on the basement ceiling or one size throughout and shunt risers out to the radiators and back into the main. Where a building is over three or four stories the overhead system will be more advantageous and, for several stories, it will be much more economical, as single pipe risers may be used. When the mains are on the basement ceiling, double pipe risers have to be used, but the supply main in the attic is omitted.

Generally speaking, the determining factors in a system of piping will be the cost of installation; that is, labor and materials. The more a job is standardized and the different parts made repetitions in construction, the less the labor charge, and labor will count more heavily than material, as a rule.

Carrying the connection for an indirect stack up two stories is only of assistance at the start in clearing the radiator of cold water. After circulation is established, the two pipes will be nearly of the same temperature. The main points to observe in any hot water job is to prevent short circuiting and air pockets.

Legislation Affecting the Heating Industry.

That there is a growing tendency on the part of many of the State legislatures to pass drastic and ill-considered laws affecting the heating industry, was the theme of a notable address delivered at the recent convention of the National Association of Master Steam and Hot Water Fitters, by Charles K. Foster, vice-president and general manager of sales of the American Radiator Company. Mr. Foster spoke as chairman of the executive committee of the National Boiler and Radiator Manufacturers' Association and urged prompt and effective measures on the part of both associations to keep in closer touch with pending legislation and to see to it that only proper and desirable laws were placed on the statute books. Mr. Foster's address was reported in the association's Official Bulletin and is as follows:

"The legislatures of a few of the States meet every year, but the greater majority meet every other year in January of odd numbered years, that is, 1915-1917, etc. Beginning the first week in January, 1915, the legislatures of practically all of the States have had sessions.

"We have noted with considerable apprehension the growing movement toward various sorts of State legislation in connection with heating matters, and particularly as regards boilers, and this tendency has been very much more marked this present year than ever before. There has been a large mass of this sort of legislation introduced this past winter, but fortunately very little of it has passed, as most of the legislatures have been congested with bills. Up to date, (and almost all legislatures have adjourned), there have been about seventy-five bills introduced in a general way affecting the heating business coming in over thirty States, and much of this legislation has been wholly ill-advised and would have worked hardships to the heating industry had the bills passed. The legislation for the most part falls in the following classes:

"1. A very large number of the bills have to do in a general way with State inspection of steam boilers, most of the bills providing for State boards of inspection and requiring boilers to be inspected periodically and a fee to be paid. There is required as high as $10, per annum fee for each boiler, as well as reports, red tape, etc., of all sorts that goes therewith.

"Some of these bills are so drastic that if they become law it would mean a large decrease in steam and hot water heating jobs in favor of furnace work, especially in the smaller jobs. Most of these bills have some

exemptions, and wherever we have been consulted or have done any work in connection with pending bills of this sort, we have endeavored to have all house-heating boilers exempted, and all other boilers exempted carrying less than 15 lbs. pressure. I presume you are all familiar more or less with the so-called code which the American Society of Mechanical Engineers has gotten out as an aid in this direction, and they define a low-pressure heating boiler as one that carries 15 lbs. or less.

"2. The second type of bill comprises a large number introduced regulating the occupation of steam engineering. We are not prepared to say whether or not this is a desirable thing from the standpoint of the master steam fitters. Perhaps in some cases it is needed, and if the legislation is intelligently drafted it might work a betterment in the industry, but most of the bills that have come to us have not been intelligently drafted and were simply fee-getting and job-creating propositions. That is where more or less of this comes from, the endeavor to create political jobs. A bill may perhaps have a perfectly proper place as applied to high pressure work, but it will be so worded as to take in boilers of every description, and if a politician wanted to appoint a lot of people to earn some money, and perhaps help in his re-election, he would have an opportunity, and when such laws get on the statute books it takes a long time to get them off.

"3. Perhaps the most pernicious of all the classes of bills are those of the type of two or three which have been pending in the Illinois legislature, but which we understand were killed before the legislature adjourned. This class of bills for the most part provides that all operators of steam boilers over a certain size (and frequently the exemption is very small), must be examined by a State board and licensed by the State board to operate a boiler.

"We found several cases of this sort where this legislation was openly backed by the stationary engineer's organization. I do not know that we blame them for trying to widen their field, but it would certainly go hard with the heating business if low pressure steam boilers must be operated by licensed engineers. What I state about the stationary engineers is simply a fact, and not in criticism, but they are like every one else, and while we grant them the right to enlarge the scope of their operations, it is equally important for us, it seems to me, and for every master steam and hot water fitter, to be just as jealous of our prerogatives which relate to the erecting of heating apparatus; and if we get too many frills around it, there will not be as many installations made.

"4. A more limited class of legislation has been that in which power was given to some board, in some cases a State board, and in Pennsylvania, for instance, a local board in each city, to pass arbitrarily upon the safety of each installation and of all fittings and accessories of each installation before the job can be accepted and put in use. Here again an intelligent supervision might be a good thing for all concerned, whereas in a case like the Pennsylvania bill it is clearly apparent that both manufacturers and master fitters would be at the mercy of political job holders.

"Not only have this sort of laws been proposed in the State legislatures, but are cropping up now in some of the larger cities, for it will be recognized that where there is no State law on the subject a municipality can regulate these things the same as it provides smoke ordinances, etc. I hold in my hand a copy of an ordinance which was almost put through the city council of Kansas City a few days ago, and it well illustrates what I am discussing. This bill came right up to the last reading, and simply through lack of proper attention and ignorance of what was going on, on the part of the trade and on the part of the boiler manufacturers, it came close to passing. I have here a clipping from one of the Kansas City newspapers with the following headings:

"'Almost "put one over."' 'Joker in an ordinance would have knocked out steam heat; or those who used it in flats and apartments would have been compelled to employ licensed engineers.'

"I will read you what the article says:

"'An ordinance which would have required every flat or apartment house which uses steam heat to employ a licensed engineer or fireman to run its boilers, was killed by the lower house council committee yesterday afternoon after the Commercial Club, the Real Estate Exchange, the Board of Education, and about fifty property owners had entered an emphatic protest against it.

"'The ordinance furnished a striking example of the slipshod methods of legislation possible under the present two-house aldermanic system.'

"Then it goes on to say that somebody 'tipped off the "joker"' that was concealed in the ordinance.

"Then it continues:

"'A committee from the stationary engineers' and the firemen's union admitted frankly it had got the ordinance introduced, and members said they believed licensed

engineers should run even the low pressure boilers.'

"Now, gentlemen, that happened just the other day, and that bill was about to pass in Kansas City, if some parties had not interested themselves and defeated it.

BOILER INSURANCE.

"There is a phase of this whole subject which perhaps might as well be discussed frankly, although it has many angles. I speak of what appears to be an organized effort to popularize or by legislation make necessary or advisable the purchase of boiler insurance by the owners of low pressure steam and water boilers. We all know that such insurance can be had and we have no objection to it, but where it appears, as it did in the legislature of a certain western State, that two paid employes of a prominent boiler insurance company were members of the legisltaure and were members of the committee to which there was referred a bill which provided that every user of a boiler of a certain size, etc., must either have his boiler inspected periodically by the State or else have it insured by an authorized insurance company—that is going too far. I do not know that the insurance companies are to blame, I am not here to criticize them, I do not know but they have a perfect right, as have the stationary engineers, to use every legitimate method they can to increase their business; but, again, we ought to have and to exercise our right, it seems to me, as master steam and hot water fitters, and as boiler manufacturers, to see that the game is played perfectly fair, and perhaps both take a hand in it; because the technical complications in all these things will in the long run decrease your business and mine, and it seems to me that this association can be of the greatest aid to the trade at large in the following up and watching of these particular legislative matters as they come up.

"I want to add for the National Association of Boiler and Radiator Manufacturers, that your officers have done very prompt and efficient work whenever we have called on them, when these legislative matters have come up. Mr. Gompers has received many letters from us and we have received many from him, and each time that we have gotten together tremendous good has come out of it.

"We had a bill that I suppose very few people living in the State of Pennsylvania know was the worst of its kind that was ever tried to be passed. It prescribed a lot of commissions; there was a chief inspector in all these cities whose salary, I think, was to be $1,800 a year. The chief inspector had to pass on every installation and on all the goods that went into the installation. You could not change the position of a radiator in an office building or a home until you made a blue-print of it and sent it down to his office and it was O.K.'d by the inspector; then you could go on about your business. When we went to Harrisburg to discuss this legislation, we were told, You are rather up against it at the present time because the State of Pennsylvania needs, or thinks it needs, a lot of money, and any bill that creates a bit of revenue is a pretty hard thing to knock out at this particular time. However, the bill was defeated, so that the master steam and hot water fitters of the State of Pennsylvania can go on about their business from now on the same as they always have. That bill was printed; it came up for final reading and was about to go on the statute books. There was a proviso in the bill that all people engaged in the heating industry should stand an examination yearly. If you happened to be a contractor in Pittsburgh and took the examination there and you had a contract in Philadelphia, you had to be re-examined in Philadelphia.

"Now these are serious things, gentlemen, and most pertinent to your business. Desiring and believing, as boiler manufacturers, and as you do, in the best and closest and the right type of co-operation among the association of master steam and hot water fitters and that of the manufacturers, I make this plea that your association, in its own way and at its own time, should plan to even more closely affiliate with the manufacturers.

"I would suggest perhaps the appointment of some committee, if that is satisfactory, who will have this particular thing very near to its heart, with the idea of looking after it. And I believe that each local association throughout the country should be advised of these different matters so that they will be on the lookout for them. Now, in justice to the gentlemen who are in politics and the gentlemen who try to put these laws upon the books, a great many of them are actuated by the very best of motives. Unfortunately, they do not know your business and ours, and the phraseology of these bills is such that, while they mean one thing, they are open to almost any implication that any one might want to put upon them.

"None of us has any objection to our customers taking out insurance on low pressure boilers, but it does not appear to any of us, I think, either master fitters or manufacturers, that we want the public in general to think that a low pressure boiler is an explosive sort of thing and must be in-

sured the same as a high pressure boiler. Now, that is what I mean about those bills. They are meant for high pressure installations, a great many of them, but they are so worded that they apply to every boiler, and were they enforced the house heating business would be turned over to the furnace men.

"The manufacturers have done what they could to watch these matters and done what they could to substitute proper bills for poor ones. We will not have very much more of it, gentlemen, for two years, because nearly all the legislatures have adjourned, but in 1917 they will reconvene, and you can depend upon it that sooner or later almost every legislature in this country is going to have something to say about boilers and inspection and about insurance. There is a great wave of "safety first," and very properly so, and the only plea I make is that you will help yourselves and help us as manufacturers in getting the right laws so that our trade will be able to expand; so that it will not be put out of business, but that we may be able to continue along in our regular way and increase our business. We believe in the business, you believe in the business, and with the co-operation such as we have always had, and as I am sure we will have in the future, I am sure that we will get through with this all right."

As a result of Mr. Foster's address it was voted to be the sense of the convention that the association have a general legislative committee, composed of the legislative committees of all of the local associations, the chairmen of the various sub-committees to report regularly to national headquarters. The details regarding the size of the committee were left to the board of directors.

National Campaign on Overhead Charges.

One of the points brought up at the recent annual convention of the master steam fitters' association was the association's campaign in connection with "overhead charges," which, according to the report of the board of directors, has probably created more comment than any other one thing which the association has done.

"It is a farce," declared the report, "for us to go on formulating methods which are universally conceded to be good and legitimate and absolutely essential to our success in business if we do not have the slightest intention of adopting them."

The report stated that "canvasses have been made by several local associations to determine the average per centum of this item of overhead charges to gross business and it has been found that it runs from 12% to 17½% or even more; yet, in view of all this, with the full knowledge of the facts before them, many master fitters still persist in adding the paltry sum of 5% to cover this item and thereby make of themselves the unfairest kind of unfair competitors. It is high time that this sort of thing should be stopped and it is up to each and every member here to see to it that in his particular case it is stopped."

A Proposal to Award Contracts to the "Average" Bidder.

The practice of awarding heating contracts to the lowest bidder came in for a sharp scoring in the report of the board of directors of the master steam fitters' convention. After defining the meaning of competition as "the act of seeking or endeavoring to gain what another is endeavoring to gain at the same time" (Century Dictionary), the report adds:

"This definition, in itself, seems sufficiently clear to be easily comprehended by all of us. But what has become the meaning of the word as applied to our own business; what is it as we really understand it?

"To such extremes has the meaning of the word been distorted as to almost blot out its primary definition. Competition in feats of prowess or skill or art always has and always will mean only strength, agility, perfection, excellence and quality. Why should it not mean the same when applied to our work?

"Unfortunately, we have grown to associate this word with one consideration only —that of price; and the word today, with us, means—the endeavoring to gain what another wants by the exercise of cupidity, without regard to perfection, excellence or quality. Such competition is unfair and is based on the policy of 'each one for himself and devil take the hindmost.'

"Those conducting their business along these lines show an utter disregard for the rights of others. Competition in the form of mere price comparison is the most degrading form of competition to those who indulge in it. Said Mr. J. B. Adams, sales and advertising manager of Iver-Johnson Arms and Cycle Works, Fitchburg, Mass., recently, 'The only phase of competition which can benefit humanity is quality competition and that is the exact antithesis of price competition. The two cannot ride

in the same boat. When price competition begins, quality competition ceases.'

"We all know that to be a fact. Why should we not adopt it as the fundamental principle of our work?

"Where did the practice of awarding the contract to the lowest bidder begin? What excuse has such a practice for existing? We all know that it is impossible to secure the best or even good work by such a method. Why should we not take the initiative in an attempt to correct this method?

"Why should we not unite in an earnest endeavor to persuade architects and owners to abandon this practice and adopt a new one? Suppose they were to award the contract to the 'average' bidder, would not this retain all the essentials of competitive bidding, eliminate all temptation on the part of the bidders to 'skin the job' and secure for the purchaser the best possible results, in accordance with the true intent and meaning of the plans and specifications?"

The Motto of the Master Steam Fitters' Association.

The motto of the National Association of Master Steam and Hot Water Fitters, which appears on the association's Official Bulletin and stationery, is "Who Helps Me, I Help." In a report of a special committee on association motto, which was read at the association's recent convention, it was stated that for several years a convention committee has struggled with the question of changing the motto which, according to the report, "expresses somewhat after the order of Shylock that we want our pound of flesh—no more—no less."

After carefully considering a list of mottoes, texts and proverbs, the committee submitted two with the request that the convention adopt by a majority vote the motto it preferred.

The first motto submitted was: Industry, Integrity, Success.

The second motto was based on the following, taken from the convention program:

1. To foster trade and commerce among master steam, hot water and other pipe fitters.

2. To reform abuses and secure freedom from unlawful and unjust exactions.

3. To diffuse accurate and reliable information concerning the address and standing of manufacturers, contractors and merchants, and other matters by monthly or weekly bulletins, or otherwise.

4. To procure uniformity in materials and certainty in the custom and usages of this branch of business.

5. To promote a larger and more friendly intercourse among those engaged in this line of business, and for general mutual protection, conservation and advancement of the business of steam, hot water and other pipe fitting.

The leading words of the foregoing objects were taken to be "trade," "justice," "help" and "friends" which suggested the motto: "Friends Help in Just Trading."

At a later session the suggestions were taken up, but it was finally decided to retain the present motto of "Who Helps Me, I Help."

Progress of Standard Flange Schedule.

An interesting sidelight on the development of a standard schedule for flanges and flanged fittings is disclosed in the report of the Committee on Standardization of the National Association of Master Steam and Hot Water Fitters, as presented at its recent convention. The committee states that the standardization of material and measurements used in the steam fitting industry is not a difficult task and can easily be accomplished by a committee that is willing to devote a certain amount of time and energy for this purpose. But the great difficulty with standardization, which requires patience and perseverance, the committee continues, comes when the contractor tries to convince the manufacturer that he ought to change his patterns, sometimes at considerable expense, to meet the proposed standard.

However, the feature of the committee's report is the account of its efforts to come to an agreement with the American Society of Mechanical Engineers regarding the name of the schedule. On this point the report says:

"At our last convention we reported the final agreement by all societies, manufacturers and all concerned on the standards of flanges and flanged fittings, and so far as we are able to find out it has been accepted by all manufacturers and societies, and we believe this matter is now settled to the satisfaction of all.

"There was an effort made by some members of the American Society of Mechanical Engineers' committee to change the name from 'The 1915 U. S. Standard' to 'The American Standard,' but we have decided to stand by the action of the last conference of March 20, 1914, at which conference all matters were definitely settled.

"At our convention last year Edward B.

Denny and E. T. Child were appointed a committee to attend the spring meeting of the American Society of Mechanical Engineers at St. Paul, it being understood that there was to be a discussion on the name of the standard, and it was thought desirable that we should be represented in that discussion.

"At this meeting the privilege of the floor was granted to Mr. Denny, and he presented the case of the National Association of Master Steam and Hot Water Fitters in a clear and concise manner. His speech was printed in the August, 1914, issue of the 'Official Bulletin' and is familiar to the membership.

"No action was taken at this meeting, as your delegates were informed that the council of the American Society of Mechanical Engineers had decided to postpone the matter of a name for the standard until some later date. The name was to be settled at a joint conference between the parties at interest.

"This conference has never been called by the American Society of Mechanical Engineers, although they have proceeded to issue a pamphlet calling the standard 'The American Standard for Pipe Flanges, Fittings and Their Bolting.' In this pamphlet they fail to make any mention of the work which the National Association of Master Steam and Hot Water Fitters did in its preparation.

"Inasmuch as the pioneer work was done by this association, the manufacturers standing out for several years and the American Society of Mechanical Engineers joining us after several years, and owing to the fact that the name of the standard was definitely settled by vote at a joint meeting held on March 20, 1914, of the committees of the American Society of Mechanical Engineers, the manufacturers and this association (to whom the matter had been referred by all of the associations and departments of the United States Government, represented at the conference in Washington on March 7, 1914), when the name 'The 1915 U. S. Standard' was adopted, this association has decided to retain the name as adopted at that meeting.

"During the past year a chart, giving all the dimensions of 'The 1915 U. S. Standard,' has been prepared by our committee and 3,000 copies of the same printed by our association and one copy has been sent to each of our members. These charts are in great demand by engineers and manufacturers because it is the first real chart that has been printed since the adoption of the standard. This chart will be reproduced in pamphlet form."

RADIATOR VALVES.

Under the subject of radiator valves, the report states that the committee has made considerable progress on the standardization of these valves and adds:

"We have not attempted to tell the manufacturers how a radiator valve should be made, but to demonstrate to them the advantage to be gained by making some of the principal dimensions standard, so that valves of all makes will be interchangeable, such as the center to end of inlet and outlet, the size and shape of the opening through the hand wheel and possibly the size of the stem and the thread of the packing nut.

"We have all had our troubles with radiator valves. When we start to rough in a job, we must first of all make up our minds what make of radiator valve we are going to use, because of the different center to end dimensions, and even so simple a repair as a new wheel to replace a broken one often costs more than a new valve would cost.

"It is to overcome all these difficulties and annoyances that we propose to standardize certain dimensions of radiator valves and we believe that great benefit will be derived from standard dimensions by the manufacturer, the master steam fitter and his customer.

"A tentative standard has already been made and submitted to the manufacturers of radiator valves, and they have appointed a committee to consider it. From previous experience we feel sure that when we get the manufacturers aroused enough to appoint a committee to consider our standard it is a very good indication that something will be done. We are prepared to confer with them on any modifications which they may suggest. It makes no particular difference to us whether a 1-in. radiator valve is 3½ in. center to end or 4 in. center to end. What we want is to get them to agree to establish a standard that will be satisfactory to all. We hope to be able to present this matter for adoption at an early date."

The committee's report closes with an account of its efforts in connection with the development of standard boiler specifications which was taken up by the American Society of Mechanical Engineers, working in co-operation with a number of other engineering bodies, and which was brought to a successful conclusion early in the present year. The representatives of the committee at these hearings were Ernest T. Child and Robert S. Parks. The other members of the association's committee on standardization were William T. English,

chairman; T. B. Cryer, S. F. Gardner and Stewart A. Jellett.

Master Plumbers' Annual Convention.

An attendance of over 600 delegates was reported at the recent annual convention of the National Association of Master Plumbers, which was held in Chicago, July 13-15. It was the largest and one of the most successful in its history. The fact that the association has just passed through an unusually trying year through the indictment and trial of some of its members, who were charged with violating the Sherman law, gave a touch of earnestness that characterized all of the sessions.

In the report of President S. Louis Barnes, a detailed account was given of the various indictments and trials of the members, including the trial at Des Moines, Ia., of 36 members; the indictment at Erie, Pa., of 32 members, and the indictment at Salt Lake City of 14 members in that locality. The Des Moines case was discussed at length.

"Great stress," said Mr. Barnes, "was laid by the federal attorneys on the previous history of the National Association and numerous excerpts from our printed proceedings, from the organization of the national in 1883 up to the time of the trial, were read into the records, as were also many letters collected by the Government agents from different individual and local and State officers. Large numbers of witnesses were presented by the Government and every effort made by them to prove their contentions as to the illegal combinations they alleged existed."

After giving further details of the trial, President Barnes continued:

"Coupled with the weakness of the case made out by the Government it was assumed that the jury could do nothing else but bring in a verdict of acquittal, or at the very most, it was thought the worst that could happen the defendants would be a divided jury. Contrary to expectations, the verdict of guilty was rendered against all the defendants, despite the fact that against a number of the defendants not one word of evidence was presented.

"Judge Pollock, in his charge, stated to the jury: 'The acts done, and declarations made by others, are not admissible to prove the fact that any defendant participated in, or became a member of the conspiracy, if any is shown to have existed, that is to say, the membership of any defendants in the conspiracy charged, if shown at all, must be established beyond all reasonable doubt by some act, conduct, or declaration of such defendant and cannot be shown by act or declaration of another person.'

"To the minds of those attending the trial, hearing the evidence and the court's charge to jury, the verdict was most unreasonable and beyond belief.

"It would seem that the court felt as we do, the verdict was unfair, else why would he have reverted to the 'grudge against plumbers' in the minds of the 'farmer' jury and the difficulty of obtaining a fair trial for the defendants in a farming community? Without doubt, the Appellate Court, to which, as you have seen, the cases of four of the defendants have been sent, will consider the matter from a legal and unbiased viewpoint and that out of that court it is hoped may issue some settled opinion which will show us in what our rights and privileges as citizens of this country consists. Also, the ruling there obtained may be instrumental in bringing about a settlement of the Erie and Salt Lake City cases and then, if, as Judge Pollock stated, 'The purpose of the Government is not * * * to punish defendants * * * but to break up a practice it deems in contravention of the law,' these defendants certainly 'will desist without present punishment.'"

Immediately after the verdict was rendered a hearing on demurrer before Judge Pollock in Des Moines, on March 20, 1915, resulted in the sending of four of the Des Moines defendants to the Appellate Court as test cases. These will come before the Appellate Court in Denver, Colo., in September, 1915.

The total membership of the National Association of Master Plumbers was reported to be 9,883, a decrease of 541. This was considered to be a remarkably good showing in view of the association's difficulties during the year.

Reference was made to the bill introduced in the Senate last year to separate heating, ventilating, plumbing and electrical contracts from the general contracts in public buildings where the cost of such work exceeded $1,000. This bill, which is known as the Taggart bill, was not passed at the last session of the Senate and an effort will be made to secure favorable action at the next session.

The report of Secretary D. F. Durkin, Jr., showed that the per capita tax for the defense fund in the trial at Des Moines amounted to $36,957, which was $3,728 more than the cost of the trial, showing the splendid support extended by the individual members towards their fellow-members.

One of the resolutions passed was that the

incoming board of directors should appoint a committee to study the bonding question in view of the fact that a recent court decision showed that the bond of the general contractor does not protect the sub-contractor. It was voted to recommend to the incoming board of directors that the matter be taken up by a joint conference committee acting in conjunction with the steam fitters and architects.

A resolution that the National Association appoint a committee to confer with the manufacturers regarding the formulation of some plan of insurance to cover the cost of installing defective goods was voted down.

The new officers elected are: President, James S. Cassedy, Cambridge, Mass.; vice-president, David H. Roberts, Cleveland, O.; treasurer, William Coach, Philadelphia. President-elect Cassedy announced the appointment of Richard J. Welch, of Lowell, Mass., as secretary.

The manufacturers' display in the German and Elizabethan Rooms of the Congress Hotel embraced sixty exhibits and were, as usual, an important feature of the convention.

Summer Meeting of British Heating Engineers.

In order that there should be no break in its activities, the summer meeting of the Institute of Heating and Ventilating Engineers was held as usual, despite the fact that many of its members were at the front while others had joined the "Roll of Honor" made up of those who had given their lives to the cause.

The meeting was held at Leamington, June 22, the sessions being presided over by President H. H. Grundy. An attendance of forty members was registered. An animated discussion arose over the advisability of the removal of the names of alien members from the roll, as had been done in the case of other institutions. Finally, except in one instance, it was decided by vote that the names of non-British subjects be dropped from the list of members.

An interesting case of sub-contracting, which had been the cause of a legal dispute, was reported to the meeting by W. N. Haden. It seems that one of the members of the institute, a heating contractor, had made a bid for some heating work with a certain county council. The bid was accepted by the architect and incorporated in the estimate of the general contractor. The general contractors subsequently got into financial difficulties and the heating contractor looked to the county council for payment. The claim was disputed and the action resulted. The heating contractor won his case in the lower court, but lost it on appeal. It is now proposed to take the case to the House of Lords, as, according to Mr. Haden, it is a case of the greatest importance to the heating trade.

A. H. Barker gave a brief report of the continued research work at the University College and mentioned the fact that both of his assistants, Mr. Brendel and Mr. Avery, were with the army in France. Mention was also made of the death of Lieut. A. C. Taylor of Manchester, who a few days previously had been killed at the Dardanelles. An expression of sympathy and regret was displayed by the meeting, the members rising and remaining silent for a brief space.

Probably the most important action taken by the meeting was the passage of a resolution "that it is desirable immediate steps be taken to fix certain standards for the trade generally and the members of the Institution particularly, and that steps be taken to make it known to architects, consulting engineers, municipal engineers and others, that the Institution of Heating and Ventilating Engineers have approved and adopted the said standards for general use:

(a) Coefficients for heat losses from glass, walls, ceilings, floors, air changes, etc.

(b) Method of calculating the total surface in square feet of glass, walls, ceilings, floors, etc., bearing in mind that losses occur through all substances in every direction, and that heat must be provided to cover all such losses.

(c) Cubic contents of room and number of times the air has to be changed per hour.

(d) Formula for ascertaining the amount of radiation or pipe surface required to meet such losses, with, say, temperature of room 6°, temperature outside 30°, and temperature of water 160° F.

(e) Diagrams or comparative tables for any other temperatures, to facilitate the testing of plants under varying atmospheric or climatic conditions.

(f) Boiler rating for heating plants, and for hot-water supply plants.

(g) Proportions of boiler power to storage capacity.

(h) Data sheets or other formula for general use in the heating trade.

(i) Form of tender, with specification of the system, boiler power, mains, coating, radiator surface, testing—giving the equivalent inside temperatures as the external temperatures vary—terms of payment, maintenance, etc.

It was suggested that the members prepare short papers on the subjects of the various headings.

Announcement was made that the autumn meeting of the Institute will be held at the Holborn Restaurant, London, October 12, 1915.

CORRESPONDENCE

The Heating of the Rupert "Electric" High School.

EDITOR HEATING AND VENTILATING MAGAZINE:

In THE HEATING AND VENTILATING MAGAZINE for May, 1914, you published a description of an electrical heating system in a school at Rupert, Idaho. In the course of this article it was stated that 261 K. W. are sufficient to keep the entire building at 70° F. with the temperature outside at —15° F. In the following paragraph the writer states that the fan has a capacity for supplying 20,000 cu. ft. of air per minute.

I cannot understand how 261 K. W. are sufficient to give the results mentioned if the fans are actually supplying 20,000 cu. ft. of air per minute, this air being drawn from outside the building at a temperature of —15° F. The air supplied would be equivalent to 1,200,000 cu. ft. per hour, and as 1 K. W. has a heating value of 3412 B. T. U. per hour, 261 K. W. will have a value of 890,532 B. T. U. per hour. This gives us the equation: 55x890,532÷1,200,000=the temperature rise of the air supplied to the building.

The result is 40.8° which will only give the air a temperature of 25.8° F., if it is entering at —15.°, I cannot see how it is estimated that 400 K. W. is sufficient for the heating and ventilation of this building, as there will be an enormous heat loss over and above the heat necessary for ventilation. From your description one is led to believe that this is not a recirculation job, but the figures which are given may be based upon recirculation. I would greatly appreciate your enlightening me on the various points raised.

Seattle, Wash. F. J. McMORRAN.

ANSWER BY GEORGE L. DILWORTH.

"In explanation of the point raised by Mr. McMorran allow me to state that Rupert system permits of recirculation when such becomes necessary. The minimum temperature of –15° occurs but, perhaps, a half dozen times during the year and on such days it is necessary, first, to fill the building with fresh air and recirculate this until the rooms are at the proper temperature, all this before the opening of the building to the pupils, and then arrange the dampers to use partly recirculated air and partly outdoor air. The maximum used the past winter was 236 K. W.

"A new high school building, larger than the Rupert building, is being built this summer in the neighboring town of Burley, Idaho. It is being equipped entirely with electric heat and will get its current from the same source as does the Rupert building—the Minidoka Government dam. The superintendent of schools there the architect and the electrical contractors all made a very thorough investigation of the workings and success of the Rupert plant before adopting the system for the Burley school."

Efficiency of House Heating Boilers.

EDITOR HEATING AND VENTILATING MAGAZINE:

I should like to have you explain the following paragraph which appeared in the "Consulting Engineer" Department for June: "Some catalogues give the evaporation per pound of fuel, based on 80% of the coal burned and in one notable case a four-section, a five-section and a six-section boiler, all of the same type, are credited with 8 lbs., 8.5 lbs., and 9 lbs. of water evaporated per pound of fuel. This means that the last mentioned boiler is 12.5% more economical than the first boiler, and therefore, overrated in the first case."

I can see why the last boiler is 12.5% more economical than the first, but the final sentence seems confusing. Just why is the 9 lb. evaporation boiler overrated in the first place? I feel sure that there is some interesting reason for this statement and I should like to get clear on it. A. J.

ANSWER BY "CONSULTING ENGINEER."

The writer will have to admit that the statement about the first boiler being overrated was somewhat of an assumption, as the square feet of surface in these boilers are never given. Most of these boilers are rated under conditions which will give the maximum amount of steam. The size of grate is given, but the heating surface between the flue and grate only in a few cases.

It is reasonable to suppose that if we have a large grate and no heating surface, we will obtain poor results. The grate is simply a reservoir for fuel and the economy is obtained by the amount of heating surface between the flue and grate, which means a larger boiler and lower temperature of the gases. If the manufacturers gave the amount of heating surface, as well as the evaporation per pound of fuel, we would be able to

pass judgment and make comparisons more readily.

By operating a boiler with a high intensity of fire more perfect combustion is obtained and a high rating secured with a small amount of heating surface. The flue gases are apt to be too high, however, tending towards uneconomical operation. Under these conditions, the more perfect combustion makes up for the loss in heat in the flue gases.

On the other hand, a very slow fire, with restricted air supply, will tend towards imperfect combustion and a greater amount of CO. This, of course, is uneconomical and will give a reduced evaporation per pound of fuel and a low flue temperature.

Inasmuch as these boilers are rated for all the traffic they will bear, the writer assumed that by reducing the rating on the first boiler or increasing the heating surface proportionately, the manufacturer would obtain a better evaporation per pound of fuel.

Relation of Windows and Ventilation in Factory Buildings.

A recognition of the importance of good air conditions in factories is shown in the recent statement of a prominent automobile manufacturer who said that manufacturers in that industry alone lose $7,270,000 annually through the illness of employees. A variety of causes may be adduced for this loss, he added, but the majority of these incidental ills could be prevented by good ventilation and plenty of light. In proof of his argument, the manufacturer submitted a report made by Dr. Katherine H. M. Blackford, a student of efficiency and the psychology of managing men.

"One factory which I was called upon to investigate was an old-fashioned building with small windows, most of them covered with the accumulated dust and dirt of years, and having only most crude and primitive methods of ventilation," reads the report. "I found in that factory, out of the possible 31,173 days' work, there was an actual loss through employees' illness of 3,512, or nearly 11¼%.

"In another factory doing the same kind of work in a modern building with excellent light and scientific ventilation I found that of the possible 85,765 days' work there was a loss through illness of 1,547 days' work, or only about 1.8%.

"The case of these two factories would not necessarily be conclusive, but in all my experience I have found the same general relationship between light and ventilation and the number and length of absences due to illness."

"Modern manufacturers have learned that the windows in their buildings are of immense importance in the making of their product," says another motor man.

"In the last eight years, walls of glass and steel have supplanted the old-fashioned brick walls in practically all of the modern factories.

"A typical example of the new 'window wall construction' is the plant of the Continental Motor Manufacturing Company on Jefferson Avenue East, Detroit.

PLANTS WITH GLASS WALLS.

"Seven buildings in the Continental group are all built with steel 'window walls,' 'fenestrated.' The factory building is almost entirely glass, supported by concrete and steel. The windows, six and seven panes high, extend from the sill, which is some 3 ft. above the floor line, to the top of the ceiling. Ventilators, horizontally pivoted and set four to a bay, give ample ventilation in the power house, 40 ft. high on all four sides, so that the visitor standing a few feet away from the building can see directly through its walls. The company uses this construction in the roof, as well as in the walls of its buildings.

"Monitor sash hung at the top and swinging out at the bottom operated in long runs by a mechanical device is used in the sawtooth construction which covers many of the assembling rooms.

"Tight when closed and projecting when open, this sash offers a means of ventilation that keeps the building comfortably cool, while at the same time it admits a flood of light throughout the entire plant.

"The sash for the Continental buildings cost upward of $23,000, yet this cost compares favorably with that of brick walls and narrow windows."

Report on Factory Exhaust Systems in Illinois.

Details of the Illinois blower law, and rulings and suggestions made under this statute, are contained in the combined twentieth and twenty-first annual reports of the Illinois chief state factory inspector. This law compels the use of blowers on metal polishing machinery for conserving the health of the workmen. One of the rulings of the department is in connection with the placing of the hoods. These are sometimes located in the rear of the wheels at a distance of from 18 to 24 in. from the point of work. This location is disapproved by the department which is ordering that the hoods be located at a point directly beneath that part of the wheel which comes

in contact with the work and as near to the point of work on the wheel as the character of the object being treated will permit. A further recommendation is made that an effective suction be placed in the rear of the wheel near the center so that floating dust from the wheel that escapes from the front suction may be carried away.

The law, of course, prescribes the minimum sizes of suction pipes for given duties as well as fan capacities and the manner of running the suction pipes. Copies of the reports may be obtained from Oscar F. Nelson, chief state factory inspector, 1543 Transportation Building, Chicago, Ill.

"Air Return Systems" as a Standard Designation.

A proposal to have a general descriptive title for heating systems now known by various names, such as "atmospheric," "modulation," "thermograde," "fractional," "vapor," and "vacuum," was made by James A. Donnelly, president of the Positive Differential System Co., at the recent convention of the National District Heating Association, in Chicago. The idea is that the prospective buyer is apt to be confused by the various names given to the same general type of system and that if some such title as "air return system" were used it would eliminate confusion as well as centering attention on this particular field. The point is made that it would then be easy to differentiate the various systems by adding the particular trade name, such as "atmospheric air return system" and "modulation air return system," etc.

The proposal is to include under the classification of "air return systems" all those that pass the air as well as the condensation down the return pipes. The name of "air return systems," it is thought, best distinguishes the new and modern types of systems, having no air valves on the radiators, from the older systems which discharge the air from each radiator through an air valve into the air of the room. It would also distinguish them from the air line systems which conduct the air down on air line to be either discharged in the cellar by pressure or drawn out by use of a partial vacuum.

Another point made by Mr. Donnelly is that it is rather difficult at present to refer properly to these systems because the elimination of the air valve on the radiator is a negative rather than a positive feature. Furthermore, most of the air return systems use a fractional or modulating valve on the inlet of the radiator, while on the outlet a wide variety of appliances is used, including thermostatic and float valves, which are intended to pass the air and water, but to hold back the steam; also devices which only partially retard such passage, such as water seals and check valves. Still other systems use only union elbows which have no function in the operation of the plant.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

AIR FLOW—

Measurement of Air Flow. Arthur K. Ohmes. Instruments. Ills. 4500 w. Jour. Am. Soc. of Heat & Vent. Engrs.—April, 1915. $1.00.

EXHAUST STEAM—

Commercial Value of Exhaust Steam. A. Langstaff Johnston, Jr. Third article of a series deals with economies to be effected in the use of exhaust steam. 2500 w. Engng. Mag.—June, 1915. 40c.

FACTORIES—

The Heating and Ventilation of Factories. Effects of impure air, problems, methods used. Ills. 3000 w. Travelers' Standard—April, 1915. Price on application.

PIPE SIZES—

The Determination of Pipe Sizes for Hot-water Heating Systems. F. E. Giesecke. General description of method developed by Prof. Rietschel. Ills. 1500 w. Jour. Am. Soc. of Heat. & Vent. Engrs.—April, 1915. Serial, 1st part. $1.00.

PULVERIZED FUEL—

Powdered Coal. W. L. Robinson. How to use it and benefits derived. 2500 w. Ry. Age Gaz.—May 21, 1915. 20c.

The Use of Pulverized Fuel for Locomotives. Outline of tests extending over a year. 2200 w. Ry. Age Gaz.—April 30, 1915. 20c.

RADIATION—

Apparatus for the Study of Heat Radiation. J. D. Hoffman. Apparatus developed by students at University of Nebraska. Ills. 1000 w. Jour. Am. Soc. of Heat. & Vent. Engrs.—April, 1915. $1.00.

VENTILATORS—

Tests of Exhaust Ventilators on Passenger Trains. George L. Fowler. Results of experimental work; effects of position of the car in the train. 4000 w. Ry. Age Gaz.—May 14, 1915. 20c.

Organization of Carrier Engineering Corporation.

An important change is announced in connection with the Carrier Air Conditioning Company through the formation of the Carrier Engineering Corporation, with offices at the same address, 39 Cortlandt Street, New York. The new company will take over all of the special air conditioning work of the Carrier Air Conditioning Company, including all applications of the latter company's machines to the various industries requiring humidifying, dehumidifying or humidity regulation. The sale of Carrier air washers has been given to the sales organization of the Buffalo Forge Company, to be handled in the future with its fan and heating apparatus. The Buffalo Forge Company will retain the name of the Carrier Air Conditioning Company. Willis H. Carrier is president and chief engineer of the new corporation; J. I. Lyle, treasurer and general manager, and E. T. Murphy, secretary.

In announcing the change the company emphasizes the fact that air conditioning is now divided into two general lines, one being air washing and humidifying in connection with the ventilation of public or semi-public buildings, such as schools, hotels, court houses, theaters, etc., the application being simply an adjunct of the ventilating equipment for which standard designed machines have been developed. For this class of work the selection of the proper

WILLIS H. CARRIER.

machine is comparatively easy and the sales force of the Buffalo Forge Company, it is stated, is excellently fitted for this service.

On the other hand, but few more complex problems are dealt with by engineers than the regulation of humidity and temperatures in various industrial processes, such as textile mills, chemical plants, celluloid, photographic paper and moving picture factories, etc.

The high position held by the Carrier Air Conditioning Company is generally credited to the excellence of its engineering staff, and it is announced that the entire staff will be taken over by the Carrier Engineering Corporation.

J. I. LYLE.

Willis H. Carrier, the president of the new corporation, has probably done more for the development of air conditioning than any other man. His contributions to the scientific knowledge of the subject have brought to him international recognition, while his success in the solving of new problems in fan engineering and air conditions, with his inventions of humidity regulating apparatus, have given him a place among the foremost engineers of the country. He has been prominent in the councils of The American Society of Mechanical Engineers and The American Society of Heating and Ventilating Engineers. His hand book, "Fan Engineering," is the most comprehensive work of its kind that has been published.

Those in a position to know give to J. I. Lyle the credit for a large measure of the commercial success of the Carrier Air Conditioning Company, for he standardized the Carrier designs for the various applications and to him was also due the company's broad and liberal policy both in dealing with its customers and in the spreading of reliable information regarding the subject of air conditioning.

Mr. Lyle's opinions on engineering sub-

jects are given much respect and consideration by those who know him. He has presented several papers before The American Society of Heating and Ventilating Engineers and The American Society of Refrigerating Engineers, being a member of both organizations, and by invitation before the International Congress of Refrigeration. Mr. Lyle will have charge of the commercial end of the new company.

E. T. Murphy, the secretary, has won a reputation as an efficient engineer who never seeks the limelight, but who possesses a wealth of knowledge on air conditioning and kindred subjects and knows how to apply it. He will supervise the Philadelphia office, in which city he is well known.

The Chicago office will be in charge of A. E. Stacey, Jr., who assisted Mr. Carrier in his earlier experiments. Mr. Stacey is thoroughly familiar with every phase of air conditioning and will be supported by the assistant manager, E. P. Heckel.

E. T. Lyle, who has made a specialty of textile mill humidification, will be retained in charge of the Boston office.

L. L. Lewis, as heretofore, will be the engineer in charge of design and estimating.

NEW DEVICES

New Type of Flow Recorder.

Little can be done to determine or improve the efficiency of operations or processes without first having accurate, quantative knowledge. The difficulty of procuring easy and convenient means to measure the rates of flow of fluids and gases has hindered to some extent the development of steam plant machinery, but this condition is now being rapidly remedied by the introduction of various types of flow meters. Because of their simplicity and the ease with which they may be standardized, weirs are preferred by many for measuring liquids, more especially the V-notch weir.

With any type of weir or orifice, the rate of flow is dependent upon the head. The rate of flow, however, at a given instant is not sufficient, but continuous or total results are needed. This has led to the development of various types of flow recorders.

Fig. 1 illustrates the principle and essential elements of a recent type of such recorders. The float moves vertically in response to change in head. Ordinarily a cam is used to translate the motion of the float to that of the recording pen. Besides taking account of the law of flow over the weir, the translating mechanism also provides the proper ratio between float movement and pen movement. This is done by making the total length of the cam much greater than the movement of the float, using a multiplying gearing between the float stem and the cam. In the flow recorder here shown, the cam is laid out as a spiral on a flat circular plate and the multiplying mechanism consists of a small drum mounted upon the spindle of the cam and having wrapped about it a thin metal cable which is attached to the float spindle, a counter-weight on another cable serving to keep the first cable taut. The spiral groove is cut into the surface of the disk

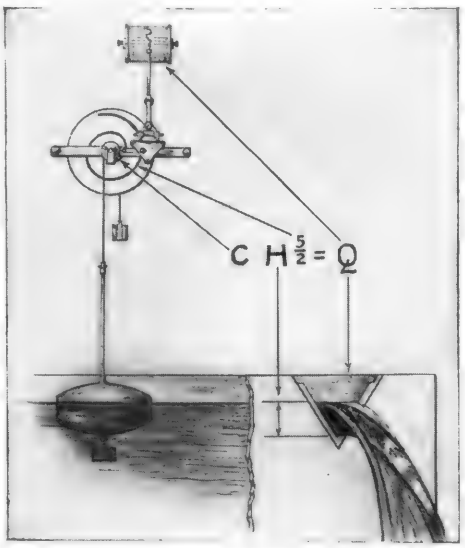


FIG. 1—DIAGRAM SHOWING PRINCIPLE OF COCHRANE RECORDER.

and is so arranged that the part of the cam corresponding to the low heads is near the center of the disk, and the part corresponding to high heads is near the periphery of the disk, whereby the angle between a tangent to the cam at any point and a tangent at the same point to a circle concentric with the disk is kept small, due to the fact that what would otherwise be the steeper part of the cam is at the greater radius. To accommodate the recorder for use with weirs of different heights it is only necessary to substitute cable drums of the proper respective diameters. One cam serves for all weirs, having the same law connecting head and flow, and hence it has been commercially feasible to devote considerable expense to the mechanical

means of reproducing this cam to insure accuracy.

The elimination of friction and backlash are prime requisites in the design of such apparatus. In the present case backlash has been eliminated by the use of a cable drum instead of the gear and pinion drive formerly employed, while friction has been reduced as much as possible by mounting the spindle of the cam upon anti-friction rollers.

The chart being driven uniformly by a clock, the pen not only records the rate of flow at each instant, but the area under the pen trace is proportional to the total flow for any elapsed period. In other words, the user of this recorder is supplied with a history of the rate of flow, as, for instance, the rate at which his boilers have been fed throughout the day, but may also obtain the total amount of water which has been fed to the boilers, and by comparing this quantity with the amount of coal used, may determine the total and average evaporation for the day. The Cochrane flow recorder is regularly supplied in connection with the Cochrane V-notch meters and metering heaters, manufactured by the Harrison Safety Boiler Works, 3189 North 17th Street, Philadelphia, Pa.

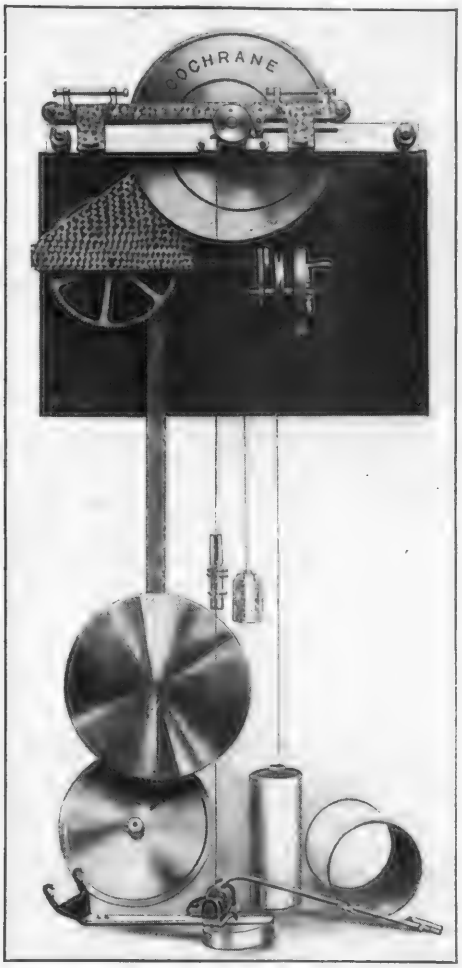


FIG. 2—COCHRANE RECORDER REMOVED FROM CASING, SHOWING ELEMENTS OF CLOCK MOVEMENT.

FIG. 3 — COCHRANE RECORDER READY FOR USE.

New Vertical Electric Condensation Return Pump.

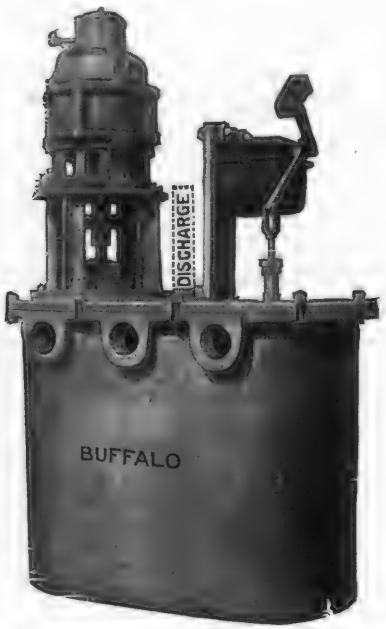
The difficulties of returning condensation on a heating system carrying very low steam pressures, with the usual steam pump and receiver outfit are well known. About three to five years ago various manufacturers of electric automatic centrifugal pumps placed these outfits on the market with the usual type of horizontal receiver elevated 6 to 10 in. above the pump. They were found to fill the requirements of low first cost, inexpensive operation and dependability, with practically no repair expense. A difficulty sometimes experienced with the original design of these outfits, however, was that the vertical height was such that to flow all condensation by gravity into the receiver, it was generally necessary to place the outfit in a pit, an undesirable location on account of dirt, heat and moisture, which affected the electrical equipment.

In the design shown herewith, which is that offered by the Buffalo Steam Pump Company, of Buffalo, N. Y., it is stated that this difficulty has been overcome and eliminated.

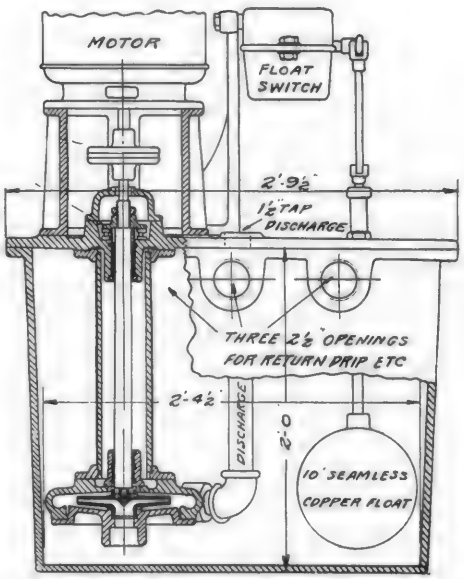
In the vertical condensation pump shown, the pump is of the vertical shaft type, submerged in a 40-gal. oblong receiving tank, which may be sunk in concrete and given no further thought, as the motor is elevated above the floor level, as is also the float switch. Here they may be given convenient attention, and having proper ventilation in this position will continue to give service without danger of being submerged by blow off from boilers, seepage or general drainage water filling the pit and drowning the electrical equipment.

All parts of the pump itself are carried on or suspended from the cover plate, which is conveniently removable, is of comparatively small weight and may be easily lifted off for cleaning or inspection of pump, pit, or float. The float is of spherical seamless copper, 10 in. in diameter, carrying a tobin bronze rod passing through the gland and stuffing box and actuating the float switch.

Leakage of steam cannot occur around the pump shaft, which is fully enclosed between pump casing and cover plate in a tight pipe casing. The weight of the moving parts is carried on a self-aligning ball bearing, the pump shaft being connected to the motor shaft through a flexible coupling.



BUFFALO VERTICAL ELECTRIC CONDENSATION RETURN PUMP.



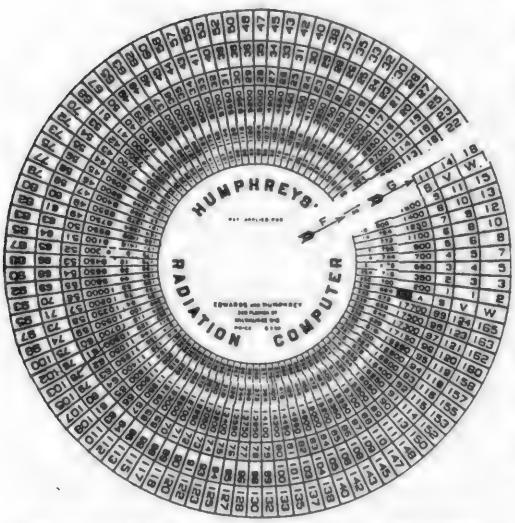
OVERALL DIMENSIONS 1-IN. AND 1½-IN. BUFFALO CONDENSATION RETURN PUMP.

The manufacturers state that the reports received from installations already made have led the company to prepare for a wide use of the outfit. The suggestion is made that inquiries should give amount of condensation to be handled, maximum steam pressure carried on the boilers, horizontal or vertical distances from pump to top of boiler and statement of electric current available for motor so that an outfit of proper capacity may be chosen.

A New Radiation Computing Disk.

An ingenious radiation computer, in the form of a circular computing disk, has been designed by Edwards and Humphrey, 300 Florida Street, Milwaukee, Wis. It is made up of three separate celluloid disks, one containing the exposed wall surface figures, the second the glass surface figures and the lower disk the cubic contents figures. The disks are so arranged that the movement of one disk on the other adds the radiation for wall, glass and cubic contents, so that the arrow will point to the final result, indicating the amount of radiation required for the room.

The computer is designed for the calculation of either steam, vapor or hot water radiation. The computations are based on a temperature of 70° F. in the room and zero outside. It is pointed out that when the outside temperature is —10° F., 15% should be added to the figures obtained by the computer. In other words, for every degree drop in outside temperature below zero an addition of 1½% is made to the radiation. For every degree increase



HUMPHREY'S RADIATION COMPUTER.

above zero a deduction of 1½% of the radiation is made. The radiation computer sells at $3.00.

ican Steam Pump Co., of Battle Creek, Mich. It is located at Avenue E and Second Street in the Palace of Machinery and consists of a comprehensive showing of the different types of Marsh and American pumps and air compressors manufactured by this company.

Among other interesting features there is shown a sectional model of a Marsh Simplex boiler feed pump giving a view of the internal parts to demonstrate its simplicity. In this type of pump there are only two moving parts on the steam end and no outside valve motion. The manufacturers claim to have some 125,000 Marsh pumps in actual operation throughout the country. Next is a Marsh deep well engine with displacement plunger, with an all bronze artesian water cylinder. This type of equipment is used for raising water from very deep wells and forcing same into overhead tanks with one operation.

Added to the above is a showing of American steam pumps for various duties and several exhibits of American motor driven power pumps with capacities from 6

EXHIBIT OF AMERICAN STEAM PUMP COMPANY AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

Panama-Pacific International Exposition Exhibits.

3—AMERICAN STEAM PUMP COMPANY.

Among the more important exhibits at the Panama-Pacific Exposition of interest to heating engineers is that of the Amer-

to 1,500 gals. per minute and air compressors. These compressors are designed according to the latest engineering practice and are claimed to be extremely efficient in operation. They are built with capacities ranging from 3 to 850 cu. ft. of free air per

minute, in both single and duplex types. Several of the pumps are shown in actual operation. The exhibit is in charge of the Simonds Machinery Company, 117-121 New Montgomery St., San Francisco, Cal., representing the manufacturers.

4—CRANE COMPANY.

Five railroad cars were used in transporting the material for this exhibit, which weighs in the neighborhood of 150 tons and occupies 4,000 sq. ft. of space in the center portion of Machinery Palace.

The main feature of interest is a 72 in. hydraulically operated gate valve weighing 57,000 lbs. and in operation throughout the exposition. A multiple steam trap working exhibit, consisting of tilt non-return traps for high pressure lines, tilt 3-valve lifting trap for low pressure lines and tilt direct return traps handling condensation in steam lines. The exhibit also contains one of each of the 17,000 articles made by the company.

The railings and arches are so arranged as to make it an educational and instructive exhibit and are composed of articles made by the company. Each side of the main entrance is made up of steam headers connected in multiple, using cast steel and wrought steel pipe with welded nozzles for the pillars. The tops of the pillars are capped with a 12-in. expansion "U" bend forming an archway. Beneath this bend and connected to the pillars is a 6 in. bend forming a loop on a complete circle. The railings on either side of the main entrance are made of a series of gate valves and "T's." One of the other entrances is made up of drainage fittings with the railings of angle and check valves and the other is constructed of pipe valves and fittings used in ice making and refrigerating plants handling ammonia.

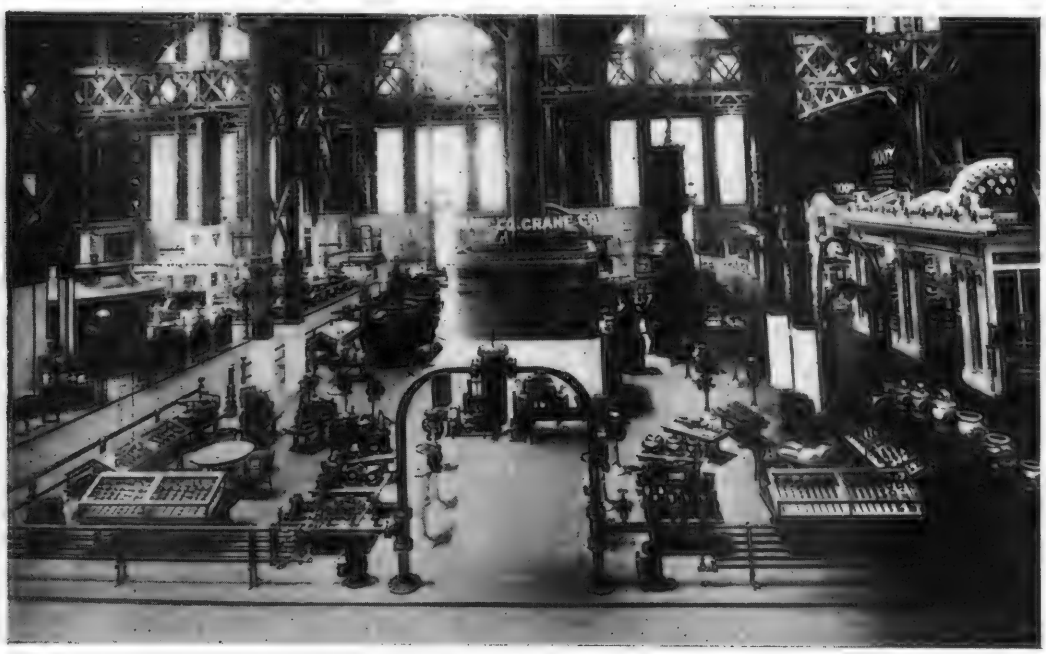


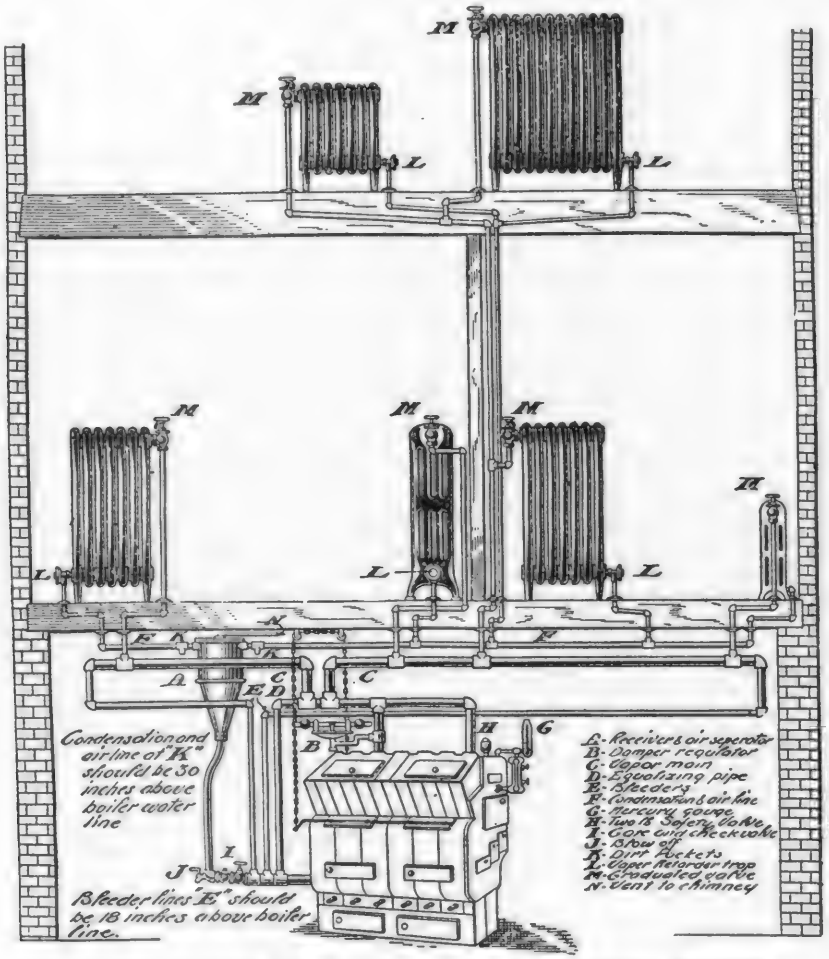
EXHIBIT OF CRANE COMPANY AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

Trade Literature.

SUPERIOR MERITS OF SIROCCO is the title of a recent circular sent out by the American Blower Co., Detroit, Mich., in which reference is made to the patent infringement suit brought by the manufacturers of the Sirocco fan against the manufacturers of the Sturtevant Multivane fan. The decision in this case, which was favorable to the plaintiff in the United States District Court, was later reversed in the United States Circuit Court of Appeals which decided that the defendant's fan does not infringe the claims and further held that some of the claims of the Sirocco patents do not distinguish it from a prior unpublished foreign patent. The circular points out that no question was involved as to the novelty of the defendant's fan nor whether it involved any invention, the opinion of the court stating that it is enough different from

the Sirocco fan so that it does not infringe the Davidson re-issued patents Nos. 12,796 and 12,797. The reason given by the court is that the defendant's fan has a practical obstruction in its intake chamber, whereby it is distinguished from the "practically unobstructed intake chamber" of the Sirocco fan. Special attention is called in the circular to the advantage of having such unobstructed intake.

trolled by a new and sensitive damper regulator. Emphasis is laid on the fact that old systems, either steam or water, may easily be converted into Kelmac vapor heating systems. The return line after connecting to a receiver and air separator in the basement is vented to the atmosphere by way of the chimney. In one of the catalogues (No. 1) all the necessary information is given for installing the



ARRANGEMENT OF KELMAC VAPOR HEATING SYSTEM.

KELMAC VAPOR HEATING, described as "the system that heats," is the subject of three recent catalogues published by the Kellogg-Mackay Co., Chicago. The system operates without pumps or mechanical devices. It is a two-pipe system and includes the Kelmac vapor retarder which is designed to expel the air, return the condensation and keep the vapor from entering the return line. There is also the Kelmac graduated radiator valve to give control of the heat in each radiator. The operation of the boiler is automatically con-

system, together with price lists, etc. Size of No. 1, 4½ x 7¾ in. Pp. 20.

CAPACITY THE SAME—EFFICIENCY GREATER is the title of a circular published by the Sarco Engineering Co., New York, in which a comparison is made of the sizes and prices of a bucket trap, with its floats, levels, water gauges, bowls, toggles and packing, with the Sarco valve. The point is made that the Sarco, rated size for size, has the same capacity as the tank trap, and costs one-third as much, while it occupies a fraction of the space. It

is also stated that the sales of Sarco valves to date amount to 350,000.

THE WALWORTH LOG, the monthly periodical published by the Walworth Mfg. Co., Boston, Mass., has some timely items on present trade conditions contributed by the president of the company, Howard Coonley, and by F. J. Chittenden, under "One Salesman's Views." An article on "Power Plant Piping," by Theodore W. Little contains some interesting hints on the lap joint or "Walmanco" joint.

GIFFORD AUTOMATIC VACUUM SYSTEM OF STEAM HEATING, of which over 3,500 successful installations have been made, is described in an interesting catalogue published by the Illinois Engineering Co., Chicago, Ill. The publishers state that the advantages secured by this system may be grouped into two general classes, either of which alone would justify its installation. These are the perfect circulation of steam and the positive operation of all the radiation throughout any heating or drying system, and the opportunity for fuel economy. The fuel economy is accomplished by the elimination of back pressure on engines, pumps, etc., supplying exhaust steam. Prominence is given to the statement that there are no patent infringement suits against this system or apparatus. The company states that its automatic float vacuum valve is the original open float water seal valve. The general arrangement of the system is shown in the accompanying diagram. At the bottom of the vacuum return main (18) is shown a by pass connection to the sewer, so that the plant can be operated as a gravity system temporarily if the vacuum pump or heater is being repaired and for blowing out the system when new. The principal devices used with this system are the float type automatic vacuum valve and the Thermo automatic vacuum valve. The catalogue also describes the Illinois Thermo modulating vapor system, which is a low pressure heating system with graduated steam control and using the same devices, together with the Illinois modulating or fractional radiator supply valve. A number of important buildings equipped with the Gifford system are shown. Size 6 x 9 in. (standard). Pp. 40.

HANDBOOK OF INSTRUCTIONS FOR DESIGNING AND INSTALLING THE STERLING SCIENTIFIC HEATING SYSTEM is a notable booklet published by the Sill Stove Works, Rochester, N. Y., and reflecting the advances recently made in the development of warm air furnace heating. The book was compiled under the direction of the company's heating engineer, William F. Colbert, formerly engineer for the Federal Furnace League. As a result of tests of its furnace, the company guarantees its heaters when installed in accordance with its published rules and instructions to be capable of maintaining a temperature of 70° F. (or other specified temperature) in every room the system is designed to heat when it is zero outside. In connection with the heat loss factors, the handbook makes use of the "Sterling heat unit," which is described as equal to the number of B.T.U. of heat lost per hour through 2 sq. ft. of outside window surface on the windward side of a building when the in-

Key to Diagram

1 Steam Engine
2 Feed Water Heater
3 Boiler Feed Pump
4 Vacuum Pump
5 Live Steam from Boilers
6 Cold Water Supply to Heater
7 Feed Water to Boilers
8 Exhaust Main
9 Back Pressure Valve
10 Gifford Cast Iron Exhaust Head
11 Gifford Cast Iron Oil Separator
12 Pressure Reducing Valve
13 Bypass around Reducing Valve
14 Exhaust Heating Main
15 Pipe Coil
16 Radiator
17 Automatic Vacuum Trap or Thermo
18 Vacuum Return Main
19 Vacuum Pump Strainer
20 Gauges and Board
21 Air Separating Tank
22 Air Vent to Roof
23 Water Seal Loop
24 Overflow from Heater
25 Gifford Steam Separator
26 Illinois Oil Trap
27 Waste Drip to Sewer
28 Automatic Vacuum Pump Governor

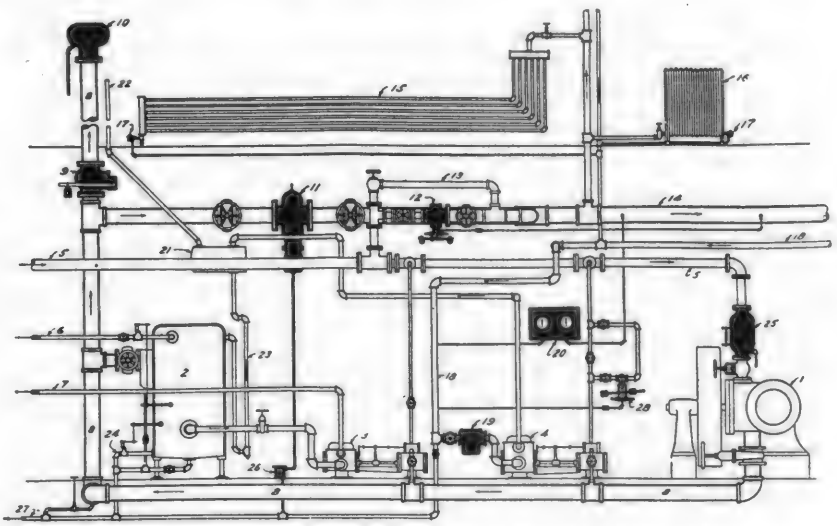
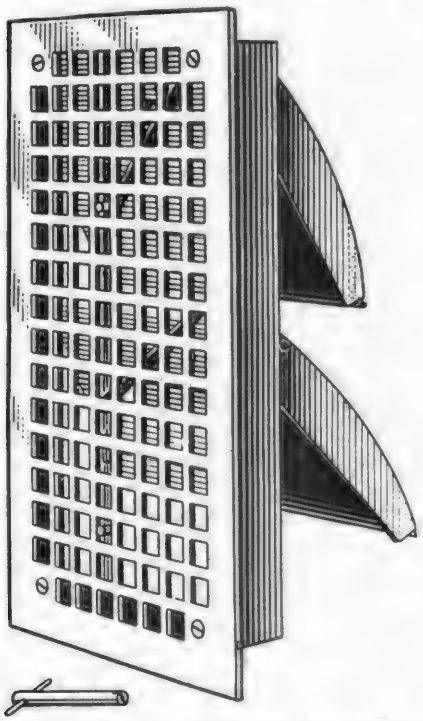


DIAGRAM OF GIFFORD AUTOMATIC VACUUM STEAM HEATING SYSTEM.

door temperature is 70° F. and the outside temperature zero. Under "first step," "second step," etc., full directions are given for designing and installing the "Sterling Scientific heating system," including items on estimating glass, wall, contents, exposures, temperatures other than 70° F., sizes, installation and covering of cellar heat pipes, partitioning heat pipes or wall stacks, trunk heat pipes, cold air supply to furnace, outside or fresh air supply, inside or return air supply, water heating coils, determining size of furnace, instructions for setting up furnace and notes on smoke pipe and chimney flue. The handbook concludes with a number of tables useful in designing the system. The publication is a notable contribution to the campaign for more scientific practice in warm air furnace heating and will be found of as much interest to heating and ventilating engineers generally as to strictly furnace men. Size 3¾ in. x 8 in. Pp. 36.

AERCO KEY OPERATED REGISTER, manufactured by Wm. Highton & Sons Co., Nashua, N. H., is featured in a newly-issued circular. This register is designed for use in connection with blower work. Through its use the flow of air may be regulated directly at the register face while the plant is in operation. The registers have been installed in buildings in which the heating and ventilating plants have been in operation for some time. A partial list of these installations is given in the circular.



AERCO KEY-OPERATED REGISTER.

AT YOUR SERVICE is a unique form of circular received from Frank A. Simonds, Grand Rapids, Mich., who has recently opened an office in the Shepard Building as manufacturers' agent for power and heating plant equipment and to act as consulting steam engineer. Among his specialties are una-flow engines, four-valve engines, single-valve engines, water-tube boilers, feed-water heaters, simplex and duplex steam pumps, rotary pumps, vacuum valves and heating specialties. His engineering services will include power plant plans, heating plant plans and power and heating plant improvement.

CENTRIFUGAL BLOWERS AND COMPRESSORS for all pressures from 5 ins. of water, as in mechanical draft service, up to 125 lbs. per square inch, as for compressed air distribution in mines, machine shops, etc., are described in a 64-page book issued by the DeLaval Steam Turbine Co., Trenton, N. J. Numerous charts are given showing curves for the isothermal, adiabatic and actual compression of air, also the theoretical power required to compress air and characteristic curves of single and multi-stage blowers and compressors. Size 6x9 ins. (standard).

LAGONDA VIBRATOR CLEANERS are an interesting product described in the latest catalogue of the Lagonda Mfg. Co., Springfield, O. This bulletin discusses the formation and removal of scale from fire-tube boilers, with special reference to the use of the Lagonda vibrator cleaner. The cleaner is also designed to loosen the soot on the interior of the tubes, to be blown out by air or steam exhausting from the front end of the turbine which is a part of the cleaner. Size 6x9 ins. (standard). Pp. 12.

New Publications.

AMERICAN HANDBOOK FOR ELECTRICAL ENGINEERS, a new handbook of which Harold Pender, Professor of Electrical Engineering, University of Pennsylvania, is the editor-in-chief, has been published by John Wiley & Sons, Inc., 432 Fourth Avenue, New York. The book is a compilation of 260 articles covering approximately 2,050 pages upon the various branches of electrical engineering and allied subjects. It has been prepared primarily for the practicing engineer, and all theoretical discussions are segregated into separate articles. The mathematical tables are notably complete and conveniently arranged. Size 4¼ x 7in. xviii—2,023 pages. Illustrated. Morocco, $5 net, postpaid.

The Unsteady Water Line in Heating Boilers.

An unsteady water line in a steam heating boiler may be due to several causes, as shown in the following sketches: In Figure 1 the water line is level with the upper return. Whenever the former drops below this level, there follows a rush of water, which fills the boiler due to the emptying of the long horizontal return. In an attempt to avoid this unsteady water line, a seal is installed as shown in dotted line, by means of which a so-called false water line is established.

In a certain installation typical of the foregoing, a seal 2 ft. 8 in. in height was used. Difficulties ensued, due to the return filling with water up to a point just below the wall radiators, and level with the top of the seal. As the vertical drop to the boiler constituted the long leg of a syphon, there was then an immediate rush of water to the boiler, due to the syphoning of the long horizontal return. Finally, a pet cock was installed at the top of the seal, and left open to break the syphon. The system has since worked satisfactorily.

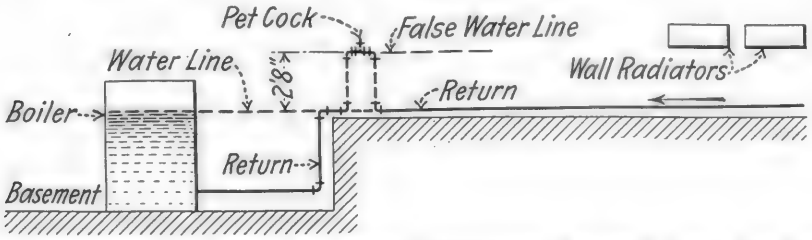


FIG. 1—LOCATION OF SEAL TO AVOID UNSTEADY WATER LINE IN BOILER.

In Fig. 2 the water column was installed at too high a point. This produced such a high water line that but slight steam space was left in the boiler. The small amount of steam usually present would condense whenever the fire doors were opened, and the resulting partial vacuum induced a rapid flow of the return water to the boiler and an unsatisfactory water line.

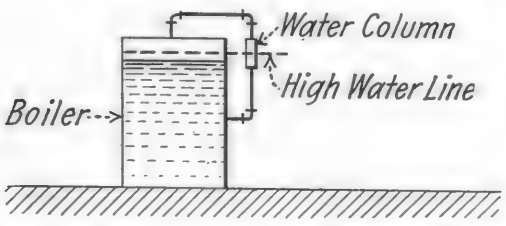


FIG. 2—UNSATISFACTORY WATER LINE CAUSED BY HIGH WATER COLUMN.

Measurements for the Household.

A new circular on "Measurements for the Household" has been sent to press by the Bureau of Standards, Washington. The circular aims to present a simple account of the more important kinds of measurements involved and their practical use in the work of the home maker. In the appendix is given a brief account of the bureau's activity in connection with the weights and measures of trade. The general subjects are commodities, heat, light, electricity and gas. Under heat the circular takes up the following:

What is meant by temperature and by heat; thermometers; convenient tests for thermometers; household thermometers, including room temperature thermometers, temperature out of doors, clinical or "fever" thermometers, reading clinical thermometers, bath thermometers, incubator thermometers, milk thermometers, maximum and minimum thermometers, candy-making thermometers, oven thermometers, refrigerator temperatures; refrigeration, including refrigerators, cooling by evaporation, frost; heating value of fuels; the saving of heat; comparison of heat insulators; radiation; heat in the household, including heating of rooms, amount of heat required to warm fresh air, amount of heat used in cooking and some other household operations, regulation of stoves, ranges, and other heating appliances, table of useful temperatures.

Copies of the circular may be obtained free upon application addressed to the Bureau of Standards. Request will be received at any time, although the printed copies of the circulars were to be ready for distribution in August.

Ohio Electric Light Association held its twenty-first annual convention at Cedar Point, O., July 20-23, 1915. Among the papers read was one on "Industrial Electric Heating," by H. O. Loebell, industrial heating engineer for the Henry L. Doherty Company.

Vacuum Cleaning Test in Hartford School Building.

Interesting results of a test of a vacuum cleaning system in the Wadsworth Street School, Hartford, Conn., are given in the accompanying curves. The building is a four-story and basement structure, the general arrangement of which is shown in the accompanying plan of the first floor. This plan also shows the vacuum cleaning piping layout. The approximate size of the school, including the kindergarten building,

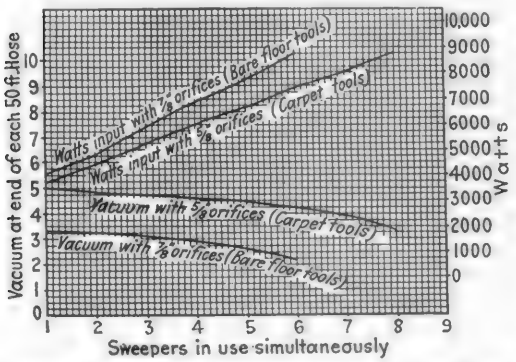

Vacuum at end of each 50 ft. Hose
Watts
Watts input with 7/8 orifices (Bare floor tools)
Watts input with 5/8 orifices (Carpet tools)
Vacuum with 5/8 orifices (Carpet tools)
Vacuum with 7/8 orifices (Bare floor tools)
Sweepers in use simultaneously

CHART SHOWING TEST OF VACUUM CLEANING SYSTEM IN WADSWORTH STREET SCHOOL.

at one end, is 345′ ft. long by 115 ft. wide. It is equipped with a Spencer high-duty central cleaning system, including a four-sweeper machine of 10 H. P. capacity. The outlets are so placed that 50 ft. of hose reaches any point.

In the accompanying chart the lower line shows the vacuum maintained at the end of 50 ft. lengths of hose with from one to six 7/8-in. open orifices. The curve just above this shows the vacuum maintained at the end of 50 ft. lengths of hose with from one to eight 5/8-in. open orifices. The two upper curves show the watt input under each of the conditions mentioned.

It is stated that among the actual results secured by this installation is a saving of $57.00 per month, representing a 33 1/3% return on the investment. This was accomplished through the reduction of the sweeping force from five to four men, while the building itself was kept cleaner than before. The installation was made by the Spencer Turbine Cleaner Co., Hartford, Conn.

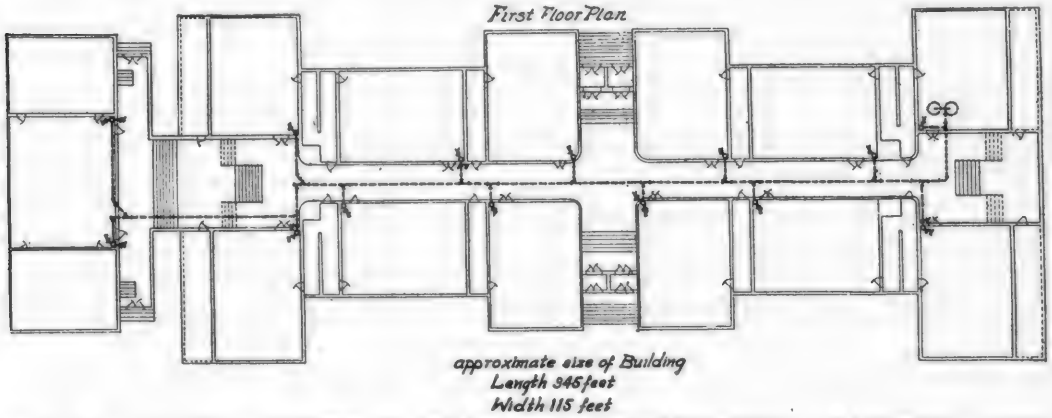
American Society of Mechanical Engineers.

The following names have been offered by the nominating committee as candidates for the offices indicated: For president, D. S. Jacobus, New York; for vice-presidents, William B. Jackson, Chicago; J. Sellers Bancroft, Philadelphia; and Julian Kennedy, Pittsburgh; for managers, John H. Barr, New York; John A. Stevens, Lowell, Mass.; and H. de B. Parsons, New York; for treasurer, William H. Wiley, New York.

At a meeting of the council, New Orleans was chosen as the place of the spring meeting in 1916.

New Quarters for the New York Office of the Lavigne Manufacturing Company.

The new quarters of the New York office of the Lavigne Manufacturing Company, Detroit, Mich., which have been taken in the Columbia Trust Company Building, 358 Fifth Avenue, New York, provide ample facilities for the handling of the company's increasing business in the sale of Lavigne products, including the Lavigne packless quick-opening radiator valves. The company's eastern sales manager is H. R. Watson.



VACUUM CLEANING SYSTEM IN WADSWORTH STREET SCHOOL, HARTFORD, CONN.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Summer Meeting to Be Held in Atlantic City Instead of San Francisco.

An important change is announced in the plans for the mid-summer meeting of the American Society of Heating and Ventilating Engineers. The society had arranged to meet in San Francisco, September 16-18, 1915. A recent canvass of the members, however, showed that many of those who favored the Exposition City as the summer meeting place would be unable to make the trip.

At a meeting of the council held August 12, the matter was discussed at length, the final decision being that it would be desirable to change the meeting place. Atlantic City was favored on account of its accessibility and also because no recent meeting of the society had been held there.

No change was made in the date, so that the society will meet in Atlantic City, Thursday and Friday, September 16 and 17. The professional programme will be the same as that prepared for San Francisco.

The Eastern members are interesting themselves in preparing a suitable entertainment programme and every assurance is given that the change in the meeting-place will not detract in any important respect from the value and pleasures of the meeting.

The programme will include the following papers and reports: "Determination of Pipe Sizes for Hot Water Heating Systems," by Prof. F. E. Giesecke, of the University of Texas; "Apparatus for the Study of Heat Radiation," by Prof. J. D. Hoffman; "Can We Locate the Neutral Zone in Heated Buildings?" by Secretary J. J. Blackmore; "Engineering Data for Designing Furnace Heating Systems," by Prof. A. C. Willard; together with a report adopted by the New York Chapter and referred to the society, of the "Profession's Efficiency and Welfare Committee."

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*Every other month.

TRADE AND MISCELLANEOUS NOTES

Coming Events.

September 7-10, 1915.—Annual meeting of the American Public Health Association, at Rochester, N. Y. Secretary, Prof. S. M. Gunn, 755 Boylston Street, Boston, Mass.

September 16-18, 1915.—Mid-summer meeting of the American Society of Heating and Ventilating Engineers, at ———. Secretary, J. J. Blackmore, 29 West 39th Street, New York.

Deaths.

Frederick N. Du Bois, who died at his summer home at Catskill, N. Y., July 8, was one of New York's most prominent manufacturers and jobbers of heating and plumbing supplies. He was 86 years old. Mr. Du Bois had been in business in New York since 1876 when he started to market the Du Bois lead trap and bend. He later added a complete line of plumbing supplies.

William Ivy, president of the Monument Plumbing Supply Co., St. Louis, Mo., died in that city June 26. He was 54 years old. Mr. Ivy was well known among the heating and plumbing trade. For many years he was connected with the N. O. Nelson Mfg. Co., rising to the position of first vice-president of the company. He organized the Monument Plumbing Supply Co. in 1910.

Jordan L. Mott, president of the J. L. Mott Iron Works, New York, died at the home of his son-in-law in that city, July 27, after a four weeks' illness. He was 86 years old. Mr. Mott was reputed to be one of the wealthiest iron founders in the east. The business of which he was president was founded by his father. The son was taken into partnership in 1863. The company is a large manufacturer of plumbing fixtures and at one time manufactured the well-known line of Sunray heating boilers and Roman radiators. Its boiler and radiator department was sold to the United States Radiator Corporation on the formation of that company in 1910. Mr. Mott leaves two children, Mrs. Charles L. MacLean, and Jordan Lawrence Mott, Jr.

Miscellaneous Notes.

National District Heating Association's executive committee will meet at Niagara Falls in September to take action on the proposition to establish an association bulletin which it is proposed to issue quarterly.

American Boiler Manufacturers' Association held its annual convention in Erie, Pa., June 21 and 22. New officers were elected as follows: President, William C. Connelly; first vice-president, C. V. Kellogg; second vice-president, C. S. Barnum; third vice-president, E. C. Fisher; fourth vice-president, Isaac Harter, Jr.; fifth vice-president, Charles S. Hooper; secretary, J. D. Farasey; treasurer, H. H. Covell.

Chicago Master Steam Fitters' Association held its annual meeting June 22 at the La Salle Hotel, the reports showing the organization to be in a flourishing condition, with a larger membership than last year. Among the reports received, one from the technical committee, composed of R. A. Widdicombe, W. B. Graves and Frank J. Douglass, told of the successful efforts that had been made during the year to adjust differences between master steam fitters, owners and architects over complaints re-

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garding the operation of heating installations. The following officers were elected: President, F. W. Lamb; vice-president, Charles Glennon; treasurer, William A. Pope; secretary, Frank J. Douglass. Board of directors: George H. Kirk, J. J. O'Shea, R. T. Ray and J. J. Herlihy.

Thomas F. Cushing, New York, well known in the pipe supply trade, has been appointed eastern sales manager for the South Chester Tube Co., Chester, Pa. His headquarters will be at 30 Church Street, New York. Mr. Cushing began his business career with the South Chester Tube Company. Previous to his present appointment, he was New York manager for the Kennedy Valve Mfg. Co., of Elmira, N. Y.

Kennedy Valve Mfg. Co., Elmira, N. Y., has appointed C. H. Kennedy as manager of its New York branch, succeeding Thomas F. Cushing. Mr. Kennedy is the son of Daniel Kennedy, the president and founder of the Kennedy Valve Mfg. Co. He has been connected with the New York branch for the past three years.

C. M. Woolley, president of the American Radiator Co., Chicago, and Mrs. Woolley are receiving congratulations over the birth of a daughter at their home in Westchester County. Mr. Woolley has recently established headquarters at the New York branch of the company.

Frank A. Simonds, formerly connected with the Simonds Heating & Specialty Co., Grand Rapids, Mich., and now operating under his own name, has opened an office in Grand Rapids, Mich., at 314 Shepard Building. Aside from his consulting steam engineering, Mr. Simonds is also selling a line of power and heating plant equipment.

Joint Committee on Fireplace Heater Design, representing the American Gas Institute and the National Commercial Gas Association, announces that judgment in the competition on fireplace gas heater design has been given in favor of R. S. Stokvis & Zonen, Ltd., of Rotterdam, Holland. The judges were three Philadelphia architects. Seventeen designs were submitted.

Leominster, Mass.—The school board of Leominster has asked the town for an appropriation of $4,000 for a central heating plant for the Fild school buildings.

Indianapolis, Ind.—A charge of bribing a Vigo County official in connection with the awarding of a heating contract has been preferred against Fred W. Gros Claude, of Indianapolis, agent for the American Warming & Ventilating Company. In an affidavit taken by Charles A. Nash, present trustee of Nevins township, it is stated that a payment of $50 was made

This is the No. 1279 RELIABLE Air Line Electric Vacuum Pump.

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operate smoothly and evenly without noise, and are most economical in current consumption. The operating cost is only one-third to one-fifth as much as for other vacuum pumps.

RELIABLE Heating Specialties—Electric and Hydraulic Vacuum Pumps, VacUstats, Vacu-Traps, Vacu-Graduate Packless Valves, "4 V" Valves, Vacu-Checks, etc., are standardized and staple, and carried in stock by most representative jobbers.

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to Henry J. Adams, former trustee of Nevins township, on July 8, 1914, in obtaining the contract for heating the new high school building at Fontanet, built last year under Adams's term as trustee. Mr. Gros Claude's bond was fixed at $2,000. Mr. Nash has the distinction of being the only Progressive candidate for that office elected in Vigo County last year.

Lost Nation, Ia.—Cornell College is arranging to install a heating system to supply all of the college buildings. The estimated cost of the plant is $75,000. The college, it is reported, is about to enter upon the most prosperous year of its career.

Madison, Minn.—The contract whereby Madison is to get its electric power for lighting, heating and other purposes from the mammoth dam at Prairie du Sac has been approved by the railroad commission. It is believed that the local company will be enabled to receive current from Prairie du Sac by October 1.

Bay City, Mich.—A central heating plant for the business district of Bay City is being advocated by the Bay City Tribune, with special reference to the abatement of the local smoke nuisance.

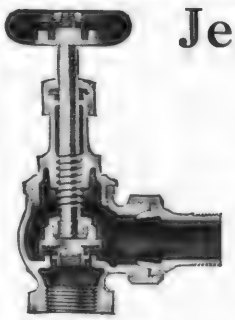
St. Paul, Minn.—Plans are being prepared by G. O. House, of the Department of Public Utilities, for a municipal light, heat and power plant in St. Paul, and they will be submitted to the council this summer, according to a statement made by Oscar Kellar, commissioner of public utilities. Commissioner Kellar, who is working up the proposition at the suggestion of Mayor Powers, stated that he had given the question of municipal light and power plants considerable study and that he believed St. Paul should line up with other cities which have such plants. He said the local plant, if the plan proves feasible, will be arranged to take care first of the municipal needs and then would branch out as a commercial proposition.

Trenton, Mo.—According to a statement made by C. H. Roland, manager of the Trenton Gas & Electric Company, that company is planning to establish a central heating plant in Trenton to supply heat to the business district. It is the company's plan to use steam from its power house, with distributing mains through the business district.

Manufacturers' Notes.

Hudson Boiler Mfg. Co., New York, has moved its offices to 358 West 42d Street, where the first floor will be used as a show room for the company's line of Hudson boilers and the Crown Gem and York Gem boilers, made by Abendroth Bros. The company's warehouse is located at the rear of the new quarters.

National Pipe Die Machine Co., Archbold, O., has acquired a site in Archbold on which it will build a plant for the manufacture of a pipe threading machine which the company is placing on the market. The officers of the company are: President, Henry Fagley; vice-president, R. Rodenhuis; secretary, August Ruihley; treasurer, L. G. Moine.



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The Jenkins Bros. Standard of construction embodies high grade steam metal, heavy design, careful workmanship and renewable disc, assuring strength, pleasing proportions, absolute tightness, and good service.

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THE FOXBORO COMPANY Succeeding The Industrial Instrument Co.

New York Chicago FOXBORO, MASS., U. S. A. San Francisco St. Louis

International Steam Pump Co., New York, which is undergoing a reorganization, will have as one of its officials, it is reported, a man who is an officer in the General Electric Company. This is taken in some quarters to indicate that the reorganized steam pump company will include in its management interests connected with the General Electric Company.

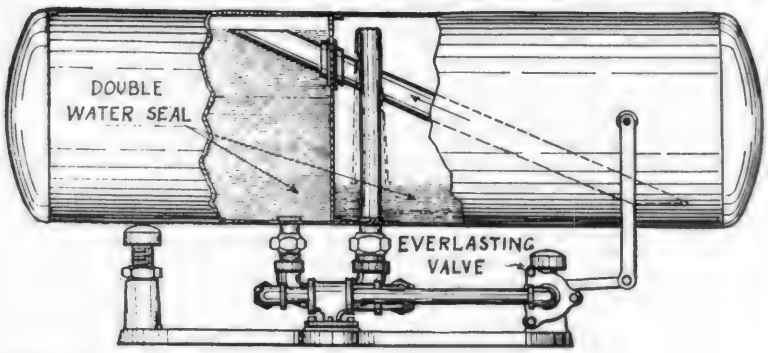
Crane Co., Chicago, Ill., has begun operations on its new $10,000,000 group of factory buildings at Corwith, Chicago, which will constitute an entirely new plant, with allowance for future expansion. The new plant will comprise 49 buildings, of steel and reinforced concrete construction, having an aggregate space of 50 acres. One of the typical buildings is a two-story structure, 500 ft. long and 80 ft. wide. The works office building will be located in the center of the Kedzie Avenue frontage. It will be five stories in height, with a tower three stories higher containing a four face 15 ft. illuminated clock dial. The heating plant, designed to serve the entire plant, will be forced circulation of hot water. It is announced that the company will maintain its present city store and sales office at 54 North Jefferson Street, Chicago.

American Radiator Co., Chicago, Ill., announces that the following central heating companies are using Sylphon regitherms and reducing values: Overbrook Steam Heating Co., Overbrook, Pa.; Merchants' Heat & Light Co., Indianapolis, Ind.; Municipal Heating Plant, Cleveland, O.; Central Hot Water Yaryan System, Findlay, O. (butterfly valve used with regitherm); Milwaukee Central Heating Co., Milwaukee, Wis.; Mineral Point Utilities Co., Mineral Point, Wis.; Central Heating Plant, Denver, Colo.; Natrona County Electric Co., Casper, Wyo.; Central Illinois Light & Heating Co., Peoria, Ill.; Manchester Power, Heat & Light Co., Manchester, Ia.; Traer Gas, Heat & Light Co., Traer, Ia.; Oelwein Gas, Heat & Light Co., Oelwein, Ia.; Windber Heating Co., Windber, Pa. (reducing valve only).

Molby Boiler Co., New York, whose incorporation was announced last month for the manufacture and sale of the Molby line of steam and hot water boilers, has organized with the following officers: President, E. C. Molby; treasurer, Martin Behrer; secretary, A. M. Behrer.

American Blower Co., Detroit, Mich., announces that Ralph T. Coe., manager of the Canadian Sirocco Co., Ltd., Windsor, since the organization of the company, has resigned to enter the engineering service and sales field in New York State. Mr. Coe has been appointed district manager for

The Farnsworth Tilt Traps



Just a tank with a double seal of water always ahead of the steam.
The positive operation of the good Everlasting Valve, which is guaranteed two years.
No packed trunnion stuffing boxes, to bind or leak.
No weights, levers, floats or buckets.
Just simplicity and improvement that is worth while.
Has five interchangeable valve controls with but one principal.
Non-return separating traps.

Lifting pumping and metering traps.
Vacuum and Metering Traps.
Variable pressure and Metering Traps.
Duplex direct return boiler feeder traps.
Order them by the amount of water they will handle, and they are cheap.
Order the right trap for the right service, and your troubles are ended.
Your coal bill will be less; our meter traps will tell you how much.
They are used for draining condensation from heating coils, radiators, dry kilns, jacketed kettles, steam mains or heated apparatus of any kind, the valve is always full opened until lines are entirely drained free from condensation and will discharge its water to any height, or against any pressure less than the pressure of steam on the apparatus it is draining from.
They will handle so much water that if you order them by the amount of the water they will handle, the steam they will save and the trouble you won't have cleaning dirt, etc., they are the cheapest traps on the market.

Send for our latest catalogue.

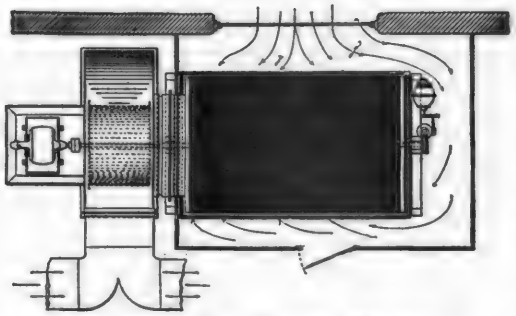
F. C. FARNSWORTH CO., Engineers BUSH TERMINAL BROOKLYN, N. Y.

Kingwelton Talks, No. 7.

One Revolution per Minute

of the

KINGWELTON ROTARY AIR WASHERS



(Patented August 13, 1912) Plan View

requires but one horsepower per 50,000 cubic feet of air supplied per minute to the building. Other volumes in proportion. This makes the cost of operation

9/10 Less

than the same service performed by other washers.

Made to fit any reasonable location and to purify any desired volume of air; 99% of the impurities removed.

A few of the many places where Kingwelton Air Washers may be seen:

The Union R. R. Station, Washington, D. C., P. R. R.
The Union Railroad Station, Pittsburgh, Pa., P. R. R.
The Singer Manufacturing Co.'s Bldg., New York
Flatiron Restaurant, New York
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People's Gas Company, Chicago
Independent Order of Foresters, Toronto, Can.
American Manufacturing Co.
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WELLS & NEWTON CO., Ave. B and 17th St., NEW YORK

Freedom From Leaky Radiator Valves

Detroit Packless Radiator Valves are positive insurance against the annoyance, expense and damage due to leaky valves.

They are absolutely tight and will stay tight—they will not leak around the stem nor need repacking.

The installation of Detroit Packless Valves means economy and permanent satisfaction for the building owner.

The first cost is the whole cost—there is no occasion for having a man spend most of his time keeping them in condition and there is no danger of their becoming unsightly from rusty, dirty water.

And the line is complete—angle—corner—globe—gate in sizes for every kind of installation on steam and hot water systems.

Illustrated booklet V-46 gladly sent on request.

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO, CANADA

Makers of the Stewart Carburetor

"A Radiator Valve That **Can't** Leak"

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Warren, Webster & Co. and the American Blower Co. and will have offices at 519 Insurance Building, Rochester, and 19 Live Stock Exchange Building, Buffalo.

New Incorporations.

Automatic Gas Steam Radiator Co., Pittsburgh, Pa., capital $5,000, to manufacture heating specialties. Incorporators: T. J. Easter, Thomas C. Hughes and F. M. Cain.

Bottum Valve Co., Chicago, Ill., capital $20,000, to manufacture heating specialties. Incorporators: George L. Bottum, Louis Hildebrand and George A. Bottum. The company's quarters are located at 162 North Dearborn Street.

Imperial Vacuum Heating Co., Chicago, Ill., capital $30,000, to manufacture vacuum heating devices. Incorporators: Burton U. Hills, William H. Beall and William V. Rifle.

Merchants' Central Heating Co., Spokane, Wash., capital $1,000,000, to operate a central station steam heating plant in Spokane. Half of the company's stock is common and half preferred. Incorporators: H. A. Flood, H. B. Ferris and P. J. Hanson. A portion of the distributing mains are now installed and work is proceeding, the intention being to have the system ready for operation in the fall.

John J. McGrath Plumbing & Heating Co., Tappan, N. Y., capital $25,000, to conduct a general heating, plumbing and gas fitting business. Incorporators: W. I. Glover, R. H. Sipp and F. C. Albee, 115 Broadway, New York.

J. B. Slattery & Bro., Brooklyn, N. Y., capital $25,000, to manufacture stoves, furnaces, heating and cooking apparatus. Incorporators: P. A. Slattery, 257 Rugby Road; J. B. Slattery, 24 31st Street, and M. C. Slattery, 348 15th Street.

United States Light & Heat Corporation, Niagara Falls, N. Y., capital $7,000,000.

W. G. Wilson, Inc., capital $3,000, to deal in heating and ventilating devices. Incorporators: W. G. Wilson, Louise Wilson and C. Brauham.

Locust Plumbing, Steam Fitting & Electric Co., Des Moines, Ia., capital $10,000. Incorporators: John Williams, Arthur Villeneuve and Roy Irwin.

Leavery Heating & Ventilating Co., Syracuse, N. Y., capital $25,000. Incorporators: A. A. Leavery, F. Leavery and E. V. Leavery, 308 Kellogg Street, Syracuse. The new company will continue the heating, power and plumbing contracting business of the late Frank Leavery.

F. O. A. Weber Plumbing & Heating Co., Akron, O., capital $5,000. Incorporators:

There is a Great Difference

these hot days—between the man-power of an employe in a Carrier Equipped factory and the man-power of an employe in a factory that knows nothing of this system.

Carrier Humidifiers

will cool the air to the outside wet bulb temperature—or an average cooling of about 15° F.

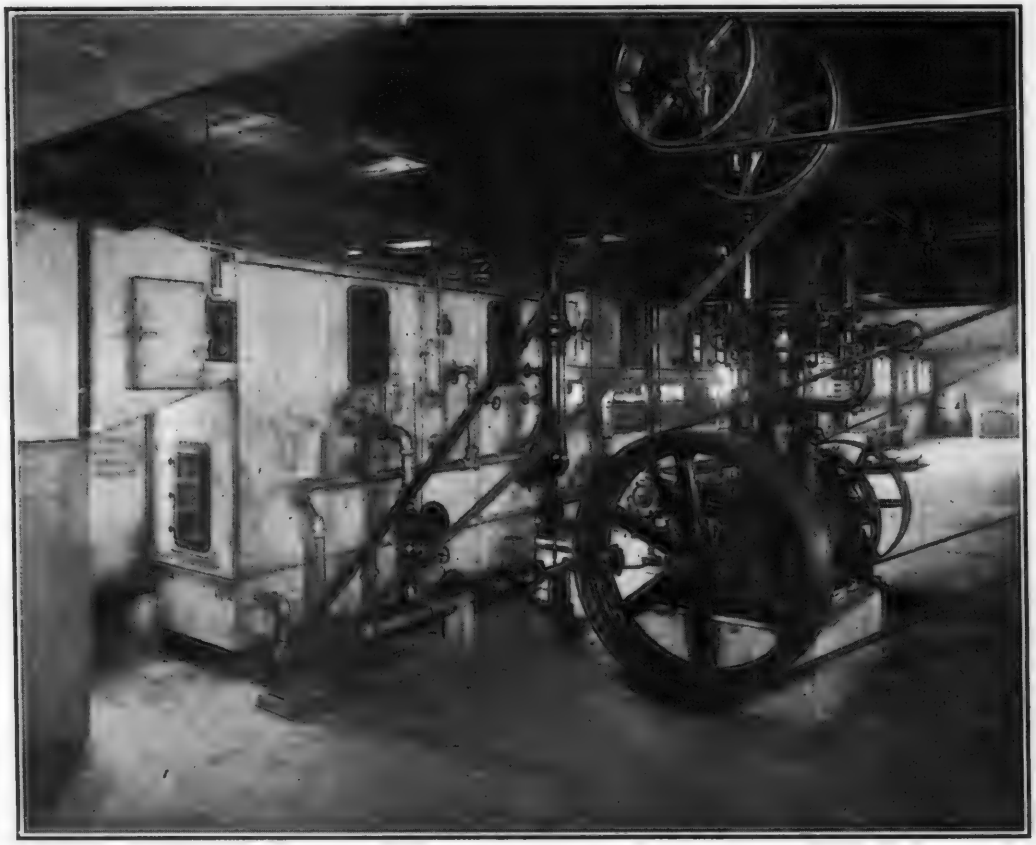
Why not investigate now—and show your clients that efficiency—in the summer time—can easily be increased by installing **Carrier Apparatus?**

Send for Catalog 13-36.

CARRIER AIR CONDITIONING CO. OF AMERICA

Buffalo, N. Y.

Boston **Philadelphia**
New York **Chicago**



Webster Air Conditioning Apparatus

Webster Air-Conditioning apparatus is constantly demonstrating its capacity, under a wide variety of exacting conditions, to effect and maintain any desired temperature and humidity.

Wherever a highly efficient and thoroughly dependable air-cooling or air-conditioning system is required, Webster apparatus, by reason of exclusive advantages, merits unquestioned consideration.

Widely installed in hotels, restaurants, office and administration buildings, as well as industrial establishments where special air-cooling and air-conditioning problems are to be met.

Our catalogues and engineering force are at your command.
We guarantee results.

WARREN WEBSTER & CO.

ESTABLISHED 1888

CAMDEN, N. J.

BRANCHES IN PRINCIPAL CITIES

H. B. Kleinknecht, F. O. A. Weber and E. J. P. Weber.

Contracts Awarded.

Kelley-Wheeler Co., Gardiner, Me., steam heating St. Joseph's Church, to cost $100,000. Plans were prepared by the Richard D. Kimball Co., Boston.

Orrin C. Poole, Boston, Mass., plumbing new Youth's Companion building at Commonwealth Avenue and St. Paul Street, for $9,000.

Bride-Grimes Co., Lawrence, Mass., heating and ventilating remodeled Tarbox School, for $8,456.

Trefle Raiche, Laconia, N. H., heating and plumbing School for the Feeble Minded at Laconia, for $5,800.

Nims & Simpson, Keene, N. H., heating and plumbing State Normal School at Keene, for $3,735.

Siebert & Co., Berkeley, Cal., heating and ventilating new intermediate school on Telegraph Avenue, for $9,427; the plumbing contract went to Eugene Ehret, of Berkeley, at his bid of $4,600.

Arnold & Evans, Spokane, Wash., heating Monroe Hall at the State Normal School, for $2,987.

Joseph A. Bernardi, Salem, Ore., heating and plumbing new wing of the Eastern Oregon Hospital for the Insane at Pendleton, for $9,890. Other bids were: Alaska Plumbing Co., Portland, heating $5,540, plumbing $6,880; Appling-Griggs Co., Portland, heating $5,000, plumbing $6,140; Rushlight & Hastorf, Portland, heating $5,101, plumbing $6,572; J. F. Shea, Portland, heating $5,583 plumbing $6,548; G. H. Sutherland & Co., Walla Walla, Wash., heating $4,978, plumbing $6,345; Sturgis & Sturgis, Portland, heating (no bid), plumbing $7,097.

Finnegan Bros. & Hill, Portland, Ore., heating and plumbing a school building at Ilwaco, for $3,755.

McGinniss Co., Pittsburgh, Pa., heating and ventilating school building at Wadsworth, O., for $3,464.

Bryce Heating & Ventilating Co., Toledo, O., heating and ventilating La Grange School in Toledo, for $8,187.

Hoagland-Lakin Electrical & Engineering Co., Los Angeles, Cal., heating and ventilating Hyde Park grammar school, for $4,983. Lohman Bros. secured the plumbing contract, at $3,935.

General Heating & Ventilating Co., Milwaukee, Wis., heating and ventilating high school at Sault Ste. Marie, for $20,540.

Western Heating Co., Los Angeles, Cal.,

H&M Thermometers

Study Closely H&M Tycos Catalogues

It may point the way to material savings in ***your*** production. We are sincere in our belief that ***our*** catalogues differ from others, not claiming especial originality, but careful preparation and interest, avoiding bombastic claims; telling rather of H&M *Tycos* Products, of their applications, illustrated and described in a concise manner, derived from over a half century's experience in thermometer making. We endeavor to build our catalogues as ***our instruments*** in such a manner they become ***assets to the owners.*** Naturally therein contained will be words as to reliability, accuracy and the reasons behind *Tycos* quality, but ***not*** to the point of of boastful boredom.

We believe if interested in Temperature Regulators, Pressure Regulators, Recording Thermometers, Angle and Straight Stem Thermometers, Engraved Stem Thermometers, Hygrodeiks and Hygrometers. Thermo-Electric and Radiation Pyrometers, our catalogues are indispensable—May we place them in your hands? Kindly name type of instrument in which you are interested.

The H&M Division
Taylor Instrument Companies
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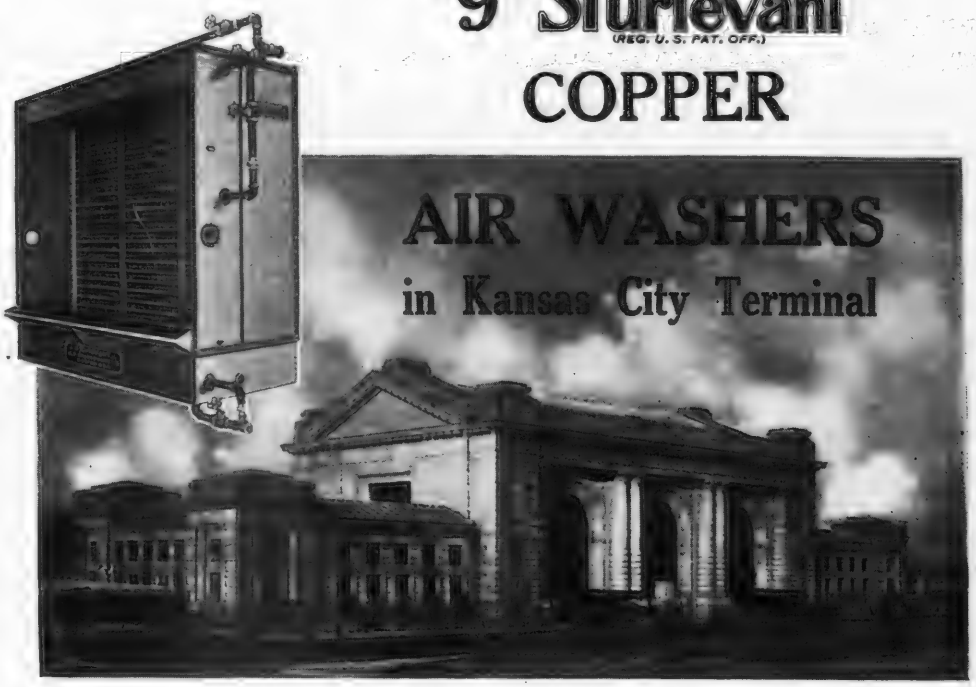
9 Sturtevant (REG. U. S. PAT. OFF.) COPPER AIR WASHERS in Kansas City Terminal



The air washers in the Kansas City Union Terminal have a combined air capacity of 301,000 cu. ft. per minute. There are two units of capacity 45,000 CFM; three units, 38,000 CFM; two units, 33,000 CFM; one unit, 24,000 CFM; and one unit 14,000 CFM.

All the air washers were guaranteed to humidify to 95% saturation with air leaving the pre-heater at 45°. The required air cleansing efficiency was 98½%.

The air washers have glass doors and observation window, and water-proof electric lights, and they are supplied by motor-driven pumps with water-cooled bearing. They operate in connection with Sturtevant Multivane Fans, of which there are 26 in the building.

Let us send you a catalogue describing the Sturtevant Air Washer

B. F. Sturtevant Company, Hyde Park BOSTON, MASS.

AND ALL PRINCIPAL CITIES OF THE WORLD

heating and ventilating Twentieth Street School, for $5,978.

Appling & Griggs, Tacoma, Wash., heating and ventilating Eatonville High School building, for $6,800. Bullard & Hill are the architects.

Cope Plumbing & Heating Co., Coeur d'Alene, Idaho, heating and plumbing new $20,000 court house at Newport, Wash.

Phoenix Sprinkling & Heating Co., Grand Rapids, Mich., heating and ventilating new high school at Hastings, for $12,903. There were nine bidders.

D. J. Sweeney, Urbana, O., heating and ventilating plant at Urbana University, to cost $5,000.

Northern Heating & Plumbing Co., Eveleth, Minn., heating and ventilating Lincoln School at Brainerd, Minn.

Grand Island Plumbing Co., Grand Island, Neb., heating and ventilating Dodge School, in that city, for $2,489.

Joseph Pollock, Hurley, Minn., heating and plumbing new town hall at Wakefield, for $2,400.

W. H. Ryan, Duluth, Minn., heating and ventilating new hospital for the Franciscan sisters at Little Falls, Minn., for $3,797; the plumbing contract went to the Virginia Plumbing & Heating Co., of Virginia, at its bid of $6,100. The cost of the building will be $50,000.

Fred J. Hotop, Kalamazoo, Mich., heating and ventilating new high school building at Lawton, Mich.

James Smyth Plumbing & Heating Co., Spokane, Wash., heating and plumbing new Mohawk Building in Spokane, for $12,000.

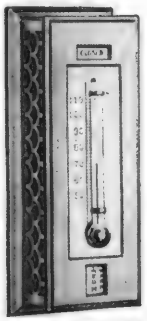
Industrial Heating & Engineering Co., Milwaukee, Wis., furnishing the apparatus, boiler, etc., for the U. S. Naval Hospital at Las Animas, Colo., to cost $18,000; also the equipment for the State of Illinois Chemistry Building, amounting to $17,000; the equipment for the Grant Street School, Milwaukee, amounting to $9,000, and the Washington High School, in Milwaukee, amounting to $27,000.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until August 13, 1915, for the construction complete, including mechanical equipment, etc., of a one-story and basement stone-faced building of 4,600 sq. ft. ground area, for the U. S. Post Office at Gardiner, Me.

Johnson Model Thermostat



OFFICE STYLE WITH INDICATOR AND SHUT-OFF

only four and three-quarter inches long, two inches wide and one inch deep, copied from the design of one of the greatest architects in the country, with the "Open and Closed" INDICATOR to show when the heat is turned "On" or "Off" and a POSITIVE SHUT-OFF for fresh air sleeping rooms. It is the final touch to an ideal heating system.

Write for Booklet

Johnson Service Company

MILWAUKEE, WISCONSIN

NOTICE—We are the owners of Patent No. 924,235 relating to the automatic control of humidity. Infringers and unlicensed users will be prosecuted.

Fans installed in the Cincinnati General Hospital

Architects' drawing of Cincinnati General Hospital.

33 Sturtevant (REG. U. S. PAT. OFF.) Fans in Cincinnati General Hospital

The new General Hospital at Cincinnati has 33 Sturtevant Fans with a combined air capacity of more than a quarter of a million cu. ft. per minute. They vary in size from Sturtevant Ready-to-Run Portable Ventilating Sets delivering 500 CFM to No. 8 Multivane Fans delivering 13,000 CFM. A Ready-to-Run set is shown below.

All fans are direct-connected to Sturtevant direct current electric motors. The largest motor is of nominal size, 10 horsepower.

Our engineers will be glad to co-operate with heating and ventilating engineers and to submit plans and specifications.

B. F. Sturtevant Company

Hyde Park **Boston, Mass.**

AND ALL PRINCIPAL CITIES OF THE WORLD

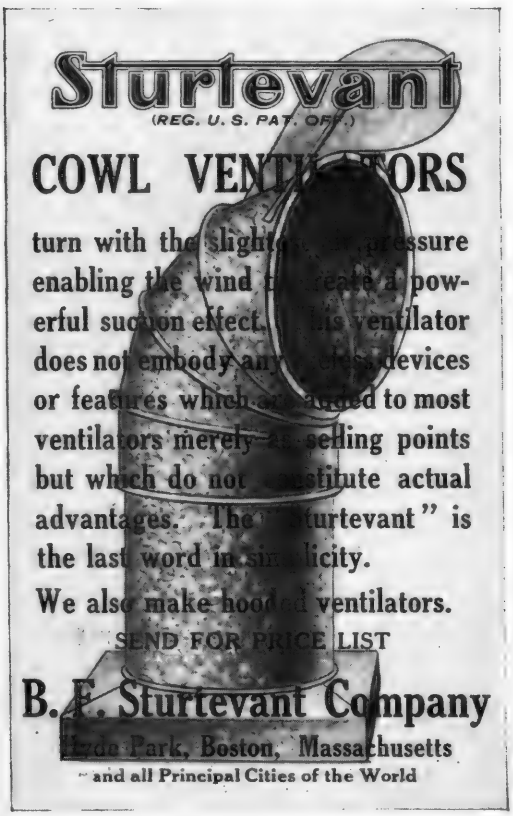
Until August 19, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office at Blackwell, Okla. Two stories and basement, 4,045 sq. ft. ground area.

Until August 20, 1915, for the construction complete, including mechanical equipment, etc., of a one-story and basement stone-faced building of 5,100 sq. ft. ground area, for the U. S. Post Office at Ypsilanti, Mich.

Until August 24, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Grand Junction, Colo.

TRADE LITERATURE.

BRISTOL'S RECORDING INSTRUMENTS, with special reference to the company's exhibit at the Panama-Pacific International Exposition, are the subject of a souvenir twenty-fifth anniversary bulletin. In view of the fact that this company was recently awarded the grand prize by the Jury of Awards for its display of recording instruments at the exposition, the



Sturtevant
(REG. U. S. PAT. OFF.)

COWL VENTILATORS

turn with the slightest pressure enabling the wind to create a powerful suction effect. This ventilator does not embody any useless devices or features which are charged to most ventilators merely as selling points but which do not constitute actual advantages. The "Sturtevant" is the last word in simplicity.

We also make hooded ventilators.

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Graduating Vapor
Heating System

Offer Your Trade Advantages They Cannot Get Elsewhere

When you go out to sell a Mouat Vapor Heating System, you can offer your customers not only the highest quality equipment, but a number of most desirable advantages that cannot be obtained in any other heating system.

Heat when it is wanted, where it is wanted, and in just the right amount—independent heat regulation in each room—expense stopped when radiator is shut off—these are some of those advantages.

You know what it means to offer your customers something they want that they cannot get elsewhere.

Write today for Booklet.

THE MOUAT-SQUIRES CO.
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MILD HEALTHFUL HEAT
When You Want It
Where You Want It
In Just the Right Amount

You can make *more money* and *more friends* by installing the HUTCHISON SYSTEM OF VAPOR HEATING than any other. Costs less to install than hot water. Write for catalog, prices and full information.

HUTCHISON VAPOR HEATING CORPORATION,
Woodward Building, WASHINGTON, D. C.

Sirocco

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The pre-eminence of "Sirocco" Fans as air handling mediums is well defined by the class of buildings in which they are installed.

Our Engineering Department is at the service of Architects and Engineers. All our bulletins are of standard size and will be sent to you upon request. The No. 2509.

AMERICAN BLOWER COMPANY

DETROIT. MICHIGAN. U.S.A.

Canadian Sirocco Company, Ltd., Windsor, Ont., Manufacturers for Canada.

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bulletin has a special value as a commemorative souvenir of the exhibit. Illustrations and brief descriptions are contained of practically all of the company's recording instruments. Size 4 x 9 in. Pp. 24.

MARSH THERMODISK AUTOMATIC AIR VALVES, a new product of Jas. P. Marsh & Co., Chicago, which were described in the last issue under "New Devices," are now the subject of a special circular issued by the company. The device is described as the only all-metal, non-carbon, non-adjustable combined independent open float and thermostatic disk sylphon automatic air valve on the market. It is for use on any radiator or coil of any low pressure one pipe gravity heating system for pressures varying up to 10 lbs. The manufacturers state that it is the best valve to give new life to the old plant, and assures long life and satisfactory service for the new installation. The features of its construction are the double expanding thermostatic disk, constructed of phosphor bronze and an independent frictionless open float. It is stated that all likelihood of the valve sticking is prevented by the construction of the open float with ground ball joint which, in conjunction with the ground seat, assures the positive closing of the vent by flotation on the arrival of water. Again, the baffle plate base is designed to guide the air to the proper channels and prevent the valve from closing through sudden air pack. The ample syphon automatically drains the water back into the radiator, keeping the valve clear of dirt, grit and scale. Various types of this valve are shown in the circular, together with price lists, etc.

THE GOSPEL OF FRESH AIR is the title of an original type of catalogue containing up-to-date opinions and data on the value of ventilation, especially in industrial buildings, and featuring the Swartwout rotary ball bearing ventilator, manufactured by the Ohio Blower Co., Cleveland, O. It is described as the simplest ventilator made, the flow of air being regulated by altering the position of the

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are manufactured in sizes from ¾ H. P. to 40 H. P.

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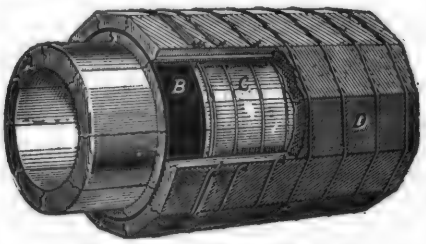

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B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

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CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steampipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

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louvers or dampers. It is not dependent upon a difference in temperatures within and without, its action being likened to the movement of a railroad train. At the end of the rear coach, for instance, the partial vacuum causes air to rush in to restore normal pressure. To still further increase the effectiveness of the Swartwout, it is designed to offer the least possible obstruction to air flow, the air making but one right-angle turn in passing through. The Swartwout swings with every change in the direction of the wind, so that the entire area is always efficient. The louvers or dampers are pivoted so as to be easily adjusted by brass chains running over brass pulleys. It is entirely storm-proof, while its construction is such that a glass top of large area can readily be substituted for the metal top, thus making a combination skylight and ventilator. The main portion of the ventilator is suspended on a construction of steel channels and angle irons, which revolve on phosphor bronze bearings and composition balls placed centrally within the ventilator. The catalogue includes a table of dimensions in inches, gauges, weights and prices, and concludes with a notable list of installations. Size 4 x 9 in. Pp. 24.

JOHNSON VAPOR HEATING SYSTEMS are the subject of a recent circular issued by the Johnson Vapor Heating Co., Boston, Mass., showing both the special apparatus used with this system and a typical layout, illustrating the method of making radiator connections. The system comprises a steam controller, open vents, supply valve and traps which, with the proper size piping, etc., are designed to operate on a few ounces of pressure. The Johnson steam controller is connected to the boiler, with chains to the dampers, giving automatic regulation. With this is combined independent regulation at the radiators. The Johnson open vent is for use either on the radiator or on the piping in the basement. The supply valve is of the packless, quick-opening type, with lever handle and graduated dial.

Wanted.

Position Wanted by engineer and estimator on heating, ventilating and power work. Absolutely satisfactory references. At present employed; desires to change. Must be good opportunity. Address Box 17, care of HEATING AND VENTILATING MAGAZINE.

Position Wanted.—Rapid, accurate and experienced heating and ventilating draftsman and estimater desires position. Can furnish best references. Address reply Box 21, care of HEATING and VENTILATING MAGAZINE.

The economy of centralized steam plants depends on the transmission—J-M Sectional Conduit is the efficient transmission

All the saving in operation expense accomplished by centralized steam plants in grouped buildings is well known. This fact is so important that plants are constantly adopting it.

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The J-M Sectional Conduit System embraces a complete underground system. Ducts, duct filler or Insulation, Supports, Drains, Racks for pipes and fittings for inspection—everything but manholes and trenches.

It has a thermal efficiency of 90% and as an investment, pays for itself in 3 years.

Don't, in the interest of economy, install an underground line of any length without investigating this system. Ask any branch for literature.

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New York and Every Large City

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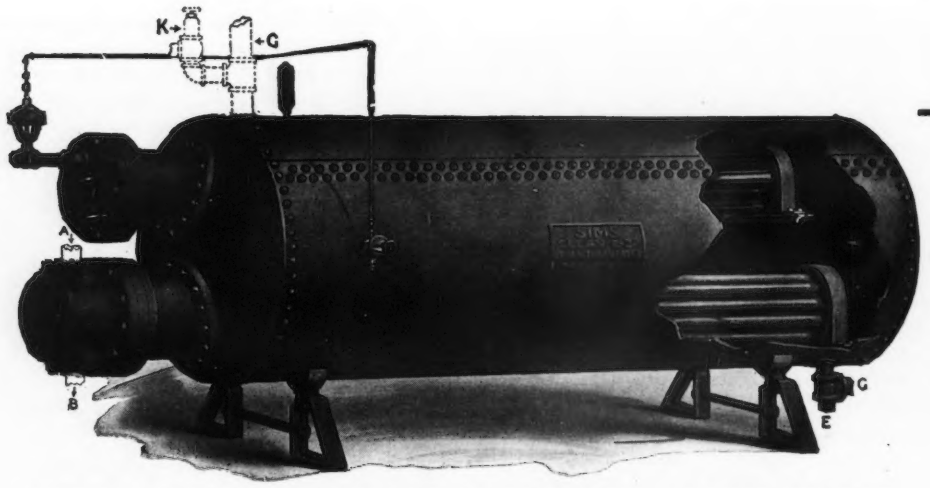

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Our large experience in manufacturing heaters for laundries has developed the fact that there is not always enough exhaust steam to heat all the water to the temperature required. This is always the case with a wet-wash laundry. For a high hot water demand use the

SIMS CLEAN E-Z HEATER, TYPE D.

This heater is supplied with two sets of straight, seamless drawn brass tubes, the lower for exhaust steam, located in the coolest water. The upper set of tubes is for live steam direct from the boiler, controlled by a thermostat.

Our Bulletin HL-2 gives full particulars of Sims Heaters for laundries, hotels, hospitals and other service. Consultation free. All work guaranteed.

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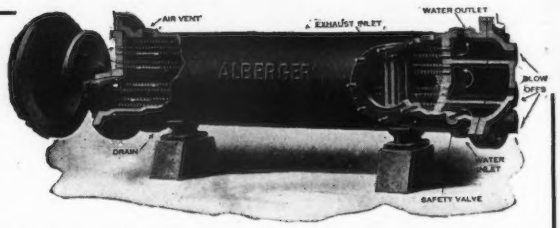

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For boiler feed water, gravity and forced circulation heating systems, hot water service for domestic purposes, etc. Catalogue on request.

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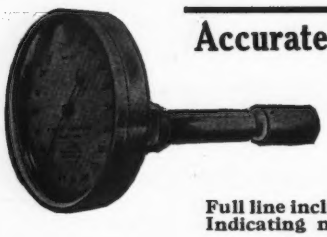

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All thermometers are double and not breakable.

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The Lytton Thermo Syphon Trap

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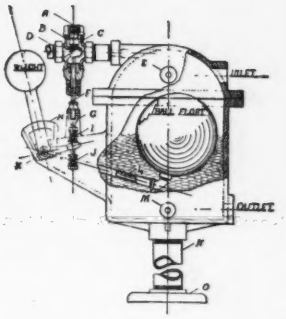
Especially designed to perform important duties in connection with the handling of condensation under the complicated operating conditions of Pressure, Vapor, and Vacuum Steam Heating Systems.



It automatically discharges all condensation direct into the boiler.
Positive in operation, irrespective of the pressure or vacuum.
Releases all air and non-condensable gases without loss of vapor.
Air relief tanks and receivers are not required with this trap.
Prevents radiators from becoming flooded or air bound.
Renders possible more heat on less boiler pressure.
Eliminates "hammering" and other nerve-wrecking noises.
Prevents burning of boilers, due to water becoming locked in system.
Assures perfect circulation and even distribution of steam.
Reduces coal consumption and labor to the minimum.
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Is installed only 3″ above water line and requires very little room.
Noiseless in operation and is easy to install.
Is heavily constructed, has no delicate parts, and is fool-proof.
Is guaranteed by us in every respect, and price is attractively low.

BULLETIN NO. 14, which will be sent upon request, fully describes the special mechanical features and refinements of this interesting device, and same should be in the possession of every Engineer, Architect, Heating Contractor, and owner of a steam heating system. We furnish full instructions and blue print for guidance in making installation and cooperate with the purchaser in every manner possible. We solicit correspondence concerning the handling of condensation from heating systems or any other class of steam using apparatus.

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